OLIN'S

COMMERCIAL GEOGRAPHY

CRANE AND COMPANY, PUBLISHERS,
TOPEKA, KANSAS.

COMMERCIAL GEOGRAPHY

BY

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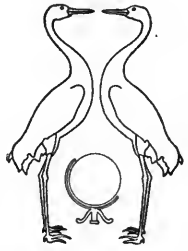

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PREFACE.

This work is designed as a guide to the study of practical facts in Commercial Geography.

It is prepared especially for the geography work of grades seven or eight in the common schools of our land.

Care has been taken to present facts and definitions in a simple form and in a correlated manner. Each illustration has been selected to teach either a geographical or a commercial fact. The illustrations are *new*, and will interest the student, fixing the truth they teach.

Part I classifies commerce and enumerates the aids to commerce. Each chapter closes with a question summary that will prove helpful to both teacher and pupil.

Part II shows the author's plan of presenting a commercial trip. It combines description and information in such a way that the pupil feels he is making the journey himself. It teaches the art of travel and the great value of close observation. This trip is carefully chosen over new routes of travel, and incidentally teaches many important commercial and geographical facts. It shows teachers a practical plan for similar trips to our greatest manufacturing and commercial centers.

Make the work as real and as practical as possible. This develops thoughtful research, strengthens memory, and quickens observation, while it gives general knowledge along valuable geographical lines.

Part III presents miscellaneous facts of commerce and geography intended to encourage laboratory work along practical lines. The author believes it to be one of the most helpful features of the book. Teachers are urged to use this part of the work as their environments would suggest and time will permit.

The world map is prepared expressly to show the commercial world in the present condition of trade, with railroad, cable and steamer lines of communication.

To simplify the International Date Line problem, the Prime Meridian is made the unit of division on the Mercator projection plan.

The continents are located to give the principal southern trade routes, even though it cuts the northern part of Siberia — unknown to commerce — out of the map.

Cities are numbered according to their commercial rank in 1900. Names are found in an accompanying index, but do not appear on the map. All cities of 150,000 population or more are located and ranked on this map.

Being prepared for constant use, the map is detached from the text and made of sufficient size to *clearly* show all elements of the map.

Hoping that the youth of our land may be led to carefully study the problems of location, trade and invention, and their intimate relation to products, occupations, and the industries of nations, the author presents this volume to aid in this work. The youth are the hope of any nation. The perpetuity of our institutions, the commercial interests of our nation, and the responsibilities of state, rest with our school children of to-day. Therefore the author dedicates this work to the school boys and girls of America.

The Author.

ACKNOWLEDGMENTS.

I DESIRE to state that valuable assistance has been given in preparing this work from the following sources: Statesman's Year Book, Consular Reports, Appleton's, Johnson's, Student's and the Manifold Cyclopedias; articles in the Forum, Popular Science Monthly, World's Work, Scribner, Review of Reviews, McClure, Cosmopolitan, Everybody's, Self-Culture, and National magazines; Guyot's Physical, Frye's, Redway's, Tarr & McMurray's, Dean & Davis's Inductive, Rand & McNally's, Morton's Political, and Chisholm's and Adams's Commercial Geographies; The Northern Steamship Co., the International Navigation Co., the agents of the N. Y. K. line in Sydney, Australia, and Manila, P. I., the Santa Fe R. R., the New York Central R. R., the Boston & Albany R. R., Mo. Pac. R. R., the Canadian Pacific R. R., the Western Union Telegraph Co., Wells & Fargo Express Co., St. Paul and Tacoma Lumber Co.; publications of the American Geographical Society, "The State," The Pathfinder, Western School Journal, Scientific American, Christian Herald; Departments of State, Navy and Treasury, Washington, D. C.; Commercial Museum, Philadelphia, Penn.; Mr. O. P. Austin, chief U. S. Bureau of Statistics; Mr. Wm. P. Wilson; Mr. S. I. Kimball, Gen'l Supt. Life-Saving Service; Mr. Arthur McMichael, Chief Clerk Dept. of State; Mr. Geo. H. Daniels; Mr. N. M. Brooks, Supt. Foreign Mails; Mr. E. C. Leedy; Mr. S. M. Campbell; Mr. Jno. F. Scott; Mr. D. G. Robertson; Mr. T. E. Fisher; Mr. J. M. Morrison; Mr. W. M. Stewart; Mr. E. C. Chenoweth; Mr. F. D. Coburn; Mr. W. H. Martin; Mr. A. B. Johnson, Chief Clerk U. S. Lighthouse Board; the U. S. Fish Commission; J. F. Moser, Commander U. S. Navy; the Armstrong Cork Co.; Glucose Sugar Refining Co.; Kellerman's Botany; American Inventions and Inventors; Stories of Industry and Cram's Atlas. Also, special acknowledgments to Underwood & Underwood, Ottawa, Kansas, for the use of many of their copyrighted views; Parke, Davis & Co.; Paris Medicine Co.; McCormick Harvester Co.; and Mrs. Winnie C. Olin.

A Patriotic Appeal.

TABLE OF CONTENTS.

INTRODUCTION

In these days of wonderful inventions, great scientific discoveries, and expanding commercial interests, the student of Geography finds a fourth division of the general subject necessary — Commercial Geography. The commercial importance and needs of our nation demand that the school children of to-day be led to study this new division. Its information will be of practical benefit, and will lead the student to see how close and vital must be our commercial relations with all other commercial or trading nations. Therefore, this new division should be given equal importance in study with the other three divisions — Mathematical, Physical, and Political.

In pursuing the study of Commercial Geography, both teacher and pupils will find a general scrap-book, railroad and steamer guides interesting and helpful. A very serviceable scrap-book can be made of cloth, the size of this geography. Make as many sheets or pages as you desire, or that can be conveniently handled. When this book gets full, make others, but have some clear plan of indexing each volume. The railroad and steamer guides can be obtained by addressing the general passenger agents of the various lines. I have always found them courteous, and glad to help along in this work. Through the station or steamer agent in your own city or town, much valuable printed matter can be procured. Many dull or listless students can be energized by this method of study, and set to earnest work when other means fail. It seems fascinating to the boys and girls, and therefore interests them, because it is useful and "up-to-date" in data given.

Frequently, many very beautiful, interesting and instructive pictures can be obtained from the various transportation companies in this and other countries, simply for the asking.

This is the "laboratory method" applied to Geography, and I commend it to the teachers of this important and essential branch of school studies in both city grades and country districts.

This work is grouped in chapters, and should therefore be studied by topics and not by pages.

The book is but a brief treatise of a very large subject, and is intended only as a manual or outline to direct students in their study of this subject and assist teachers in their assignment and recitation of lessons.

The most expensive features in all geographies are the maps, and as a good outline wall map and an authentic atlas should be in each school-room where advanced work in geography is expected, continent and national maps are omitted in this work. In a pocket in back cover of the book will be found a commercial map of the world, showing the greatest trade routes by land and by water, and all great commercial cities, as well as the most influential agencies affecting trade routes. This map is on the Mercator projection plan, but with different division lines from those shown in previous maps, that the question of the International Date Line may be simplified. As this map must be used almost daily, it is placed on substantial cloth, and should, with careful usage, last as long as the accompanying book.

W. H. OLIN.

Ottawa, Kansas, October 1, 1901.

CONTENTS OF PART I.

PART I.

AIDS TO COMMERCE.

School Children of America

Christiana's Largest Market, Norway.

OLIN'S COMMERCIAL GEOGRAPHY.

CHAPTER I.

Commerce.

Commerce is an interchange of various productions and manufactures between individuals, communities or nations. If the interchange be between individuals or communities in the same nation, it is called domestic commerce; when between individuals or communities in different nations or governments of nations, it is called foreign commerce.

The farmer raises his grain, fruit and stock on his farm and sells the same to the commission merchant, storekeeper and stockman, who in turn sells the grain, fruit or stock either to consumers or large dealers. In this way commerce had its origin. The manufacturer generally gravitates toward that locality that furnishes good facilities naturally for power and water-supply. Here capital invests itself and a commercial city springs into being. Because of its abundant water-supply coming from its hills and the vast quantities of building-stone resting within these hills, New England has always been the center of a great manufacturing industry. This fact, together with its good harbor and proximity to these manufacturing plants, has made Boston the channel through which manufactured goods of New England have reachel

foreign trade; hence Boston early became a strategic seaport and commercial harbor.

The ocean harbor, geographical location and the Erie Canal made New York a logical metropolis, led industries to invest themselves and trade routes to center there. Pittsburg's almost inexhaustible coal-beds gave her logical precedence in the iron and steel industries. Chicago through her natural advantages and location gained the trade and industries that make her the greatest inland mart in the world to-day.

The vast fields of cotton in the South, with her good fuel and water-supply, are to-day inviting the manufacturer, and millions of dollars are being invested in mills to work up the cotton in fields adjacent to these cotton mills, saving the expense of a long haul. This land is adapted to cotton culture, the climate congenial, and hence cotton has become a staple crop in these Southern States. This, together with the ore and coal in the mountains near at hand and an abundant water-supply, is planting large commercial centers all through our South-land.

Then we learn that the physiography of a country has much to do in locating trading marts and manufacturing centers.

An agricultural region may maintain a thriving town or city, but a city of commercial importance must have good connection by rail or water with the commercial world in order to thrive and prosper.

When an individual sells more than he buys, he is said to prosper. When a nation of individuals in the aggregate sells more than it buys, the balance of trade is said to be in its favor, and it is prosperous. The United States sold more than it purchased, in 1900, and had a net balance of $545,000,000 in its favor.

When an individual buys more than he sells, he is said to draw on his credit or go in debt. Such a person is losing money, and therefore not prospering.

When a nation of individuals buys in the aggregate more than it sells, the balance of trade is said to be against it, and it is not in a prosperous condition. In 1873 our nation spent $119,656,000 more than it sold. Our people lost confidence in one another, capital withdrew from investment, and the worst financial panic in forty years fell upon business interests throughout the nation.

The balance of trade was against the United States by many millions of dollars again in 1893, and business interests were again seriously crippled.

These two instances cited above brought hard times, probably intensified from other and complex causes, when men failed in business, families lost homes, farms were mortgaged, debts unpaid, and fewer students attended colleges and universities, as they had to help father and mother "keep the wolf from the door."

Profits from a good balance in a nation's favor, with all other interests economically administered in governmental affairs, give money to invest in public and private improvements, that shall quicken, stimulate or attract trade. Good buildings of fire-proof material in cities, well-paved streets, telephones, railroads, together with many public and private luxuries in home life and in the office, generally follow in the wake of a good trade balance. Our nation's commerce passed the two-billion-dollar limit in 1900.

In 1850 it amounted to.....	$378,000,000
1860	687,000,000
1870	829,000,000
1872	1,070,000,000
1880	1,504,000,000
1890	1,647,000,000
1900	2,242,000,000

In 1900 our exports amounted to $1,394,000,000 and our imports to $848,000,000.

Exports are the goods or merchantable articles shipped from commercial centers to foreign ports or commercial centers. Imports are the merchant-

able articles brought into a commercial center from a foreign port or commercial center.

In the markets of Africa and Japan our nation's commerce has increased five hundred per cent. Where France spent forty cents with us in 1890, to-day she spends a dollar. Ten years ago Germany spent fifty-six cents with us, while now she spends one dollar and fifty cents with us.

Great Britain in 1890 spent $3.62 in the United States, where now she spends $5.40; and all other countries that ten years ago spent one dollar with us, now spend three. Great as is our foreign trade, we spend the most of our money at home. Where foreigners spend one dollar at our counter, we aggregate sixty dollars.

The world's commerce was estimated in 1900 to be $14,500,000,000. The chief commercial nations of the world are here given, with the amount of each nation's commerce.

These data are taken from the statistics sent out by the Philadelphia Commercial Museum, and give the commerce for each country named for year ending December 31, 1900, in millions of dollars.

Cheapside, formerly the World's Commercial Center, London, England.

Rank.	*Name.*	*Imports.*	*Exports.*	*Total.*
1	Great Britain	2,548	1,419	3,967
2	Germany	1,388	1,050	2,438
3	United States	829	1,453	2,282
4	France	882	815	1,697
5	Netherlands	770	636	1,406
6	Belgium	409	347	756
7	Austria-Hungary	337	382	719
8	Australia	345	360	705
9	British India	293	374	667
10	Russia	302	363	665
11	Italy	340	267	607
12	Switzerland	215	164	379
13	Canada	172	169	341
14	Spain	171	141	312
15*a*	China	158	119	277
15*b*	Hong Kong	19	10	29
16	Argentina	113	155	268
17	Japan	143	100	243
18	Straits Settlements (Asia),	117	103	220
19	Sweden	122	92	214
20	Brazil	90	122	212
21	Denmark	111	75	186
22	Dutch East Indies	77	100	177
23	Egypt	70	86	156
24	Norway	89	47	136
25	Mexico	61	72	133
26	Algeria	66	66	132
27	New Zealand	53	66	119
28	Cuba	72	45	117
29	Cape Colony	81	35	116
30	Chile	39	59	98
31	Portugal	64	33	97
32	Roumania	64	29	93
33	Ceylon	37	37	74
34	French East Indies	37	31	68
35	British West Indies	28	26	54
36	Uruguay	24	29	53
37	Greece	26	20	46
38	Hawaii	19	22	41

COMMERCE OF CHIEF COMMERCIAL NATIONS—CONTINUED.

Rank.	Name.	Imports.	Exports.	Total.
39	Philippine Islands	20	20	40
40	Persia	27	13	40
41	Venezuela	13	22	35
42	Natal	29	6	35
43	Siam	12	18	30
44	Colombia	11	19	30
45	Peru	8	13	21
46	Bolivia	11	10	21
47	Portuguese Africa	14	7	21
48	Servia	9	12	21
49	Bulgaria	9	11	20
50	Porto Rico	10	10	20
51	Turkey	12	6	18
52	Haiti	4	12	16
53	British Guiana	6	9	15
54	Zanzibar	8	7	15
55	Mauritius	6	8	14
56	Senegal (Africa)	10	4	14
57	Ecuador	5	8	13
58	Guatemala	3	8	11
59	German Africa	7	3	10
60	Madagascar	8	2	10
61	Martinique	5	5	10

(The other countries of the world have a commerce of less than ten million dollars each.)

The following analysis of the commerce of the United States for the year ending December 31, 1900, tells at what national counters our nation does her trading. (Given in millions of dollars.)

EXPORTS AND IMPORTS.

	U.S. Exports to.	U.S. Imports from.
Great Britain	602.2	151.5
Germany	197.6	103.5
Canada	104.8	40.7
Netherlands	83.7	17.3
France	82.5	72.7
Belgium	46.9	14.6
Mexico	38.3	28.2
Italy	36.7	27.1
British Australasia	28.2	5.3
Cuba	26.9	31.7
Japan	26.5	26.3
British Africa	19.2	1.1
Denmark	15.5	.8
Spain	15.2	5.5
Sweden and Norway	11.5	4.4
Brazil	11.5	65.0
Argentina	11.1	8.1
China	11.1	22.9
Hong Kong	9.2	1.3
British West Indies	8.6	12.4
Russia	11.3	7.8
Austria-Hungary	7.6	10.5
Hawaii	7.5	9.3
Portugal	5.7	3.3
British East Indies	5.2	43.3
Chile	4.6	7.5

EXPORTS AND IMPORTS—CONTINUED.

	U.S. Exports to.	U.S. Imports from.
Haiti	3.7	1.3
Philippine Islands	3.5	6.1
Venezuela	3.0	6.5
Porto Rico	2.8	2.4
Colombia	2.6	3.1
Peru	2.3	2.9
Dutch East Indies	1.9	20.9
British Guiana	1.8	4.6
Santo Domingo	1.8	3.2
Nicaragua	1.7	1.7
Uruguay	1.7	2.1
Costa Rica	1.7	2.9
Ecuador	1.6	1.6
Egypt	1.5	8.5
Bermuda	1.2	.5
Guatemala	1.1	2.2
Honduras	1.1	1.1
French Africa	.9	.....
Aden	.8	1.6
Portuguese Africa	.8	.....
Salvador	.7	.7
British Honduras	.6	.1
Danish West Indies	.6	.4
Dutch West Indies	.6	.2
Gibraltar	.6	.....
Dutch Guiana	.5	1.3
Azores and Madeira Islands	.5	.....

The commerce of the United States with the other commercial countries amounts to less than a quarter of a million dollars to each country.

The following table gives the data on our nation's commerce in the world by continents, in millions of dollars:

	U.S. Exports to.	U.S. Imports from.
Rest of North America	176.6	130.0
South America	38.3	93.6
Africa	19.5	11.2
Asia	64.7	139.8
Oceanica	42.8	34.6
Europe	1,028.7	440.5

The United States first ranked all other countries as an exporting nation in 1898. Great Britain regained this place the next year, to be again supplanted by the United States in 1900. The imports from and the exports to Europe constitute more than one-half of the world's trade to-day.

Europe purchases three-fourths of our exports and sells us fully half our imports.

Machinery has enabled manufacturing nations

to produce more than they can consume, and to-day these nations seek new avenues of trade for their wares.

Our nation, with European countries, is seeking trade in Asia, Africa, and Australia. The possession of the Philippine group places the United States in a position to secure a greater share of the Asiatic import trade. This will greatly increase our Pacific trade and open new markets for our surplus products. Our exports show a constantly increasing per cent. of manufactured goods, while our imports show an increasing per cent. of raw materials demanded by the rapid development of our manufacturing industries.

Our nation's share in the import trade of the continents is shown in the following table:

Continent.	*Per cent. of imports from United States.*
North America	53.0
South America	12.5
Europe	15.2
Asia	6.3
Africa	6.5
Oceanica	7.4

This country has entered the international market. Her commerce is upon every sea, her goods are in many lands. The nation is maintaining its per cent. of trade in North America and is materially increasing its per cent. in Asia and Oceanica, while it continues to receive a half-billion-dollar balance of trade from Europe.

QUESTION SUMMARY.

1. What is the essential difference between foreign and domestic commerce?

2. Which is the greater in our nation, foreign or domestic commerce?

3. What generally determines the location of a commercial center?

4. Why has New England for a hundred years ranked the other States in her manufactures, and why does she continue to head the list of manufacturing States of our nation?

5. Name ten commercial cities, and tell how they became great centers of trade.

6. What do we mean by the physiography of a country?

7. How and in what way does it affect commerce?

8. What reasons can you assign for the present action in planting great manufacturing industries in the South, East and South-Central States, employing millions of dollars of capital, making this section a great manufacturing region to-day?

9. Name some of the locations of these manufacturing plants, and state the character of their manufactures.

10. Which is generally largest—an agricultural, commercial, or manufacturing city? Why?

11. Explain what is meant by balance of trade.

12. Only a few times within the last thirty years has the balance of trade been against our nation, yet what was the result in 1873 and 1893?

13. Can we say that this was wholly the result of the unfavorable trade balance?

14. What are the general indications of commercial prosperity?

15. Our commerce always consists of what two elements?

16. Which should be the greater to indicate a profitable trade balance to a nation?

17. Which should be the greater to indicate a losing trade?

18. When did our commerce reach the one-billion-dollar mark?

19. Can you account for the great difference between the commerce of 1860 and 1872?

20. How long after 1870 before our commerce was doubled? How may we account for this?

21. Where, in the world, has our commerce increased five hundred per cent.?

22. Does this indicate that our Pacific coast commerce is more vigorous than our Atlantic and Gulf commerce? *Ans.*, No; but that great development is being shown in this region, and that probably the great accessions to our commerce will come largely through the Pacific ocean commerce.

23. Which nation sells the most to the United States?

24. Which nation buys the most from the United States?

25. Then what per cent. of our trade goes to this country?

26. What nation in the world has the greatest commerce? Can you account for this?

27. How does the United States rank as a commercial nation?

28. What ocean is the greatest commercial ocean to-day? Reason for answer.

29. Name the seacoast cities of our nation through which the commercial nations of the world trade with the United States.

30. Name the seacoast cities of the other commercial powers through which the United States trades with them.

31. Which continent sells the most goods to our nation?

32. Name, in order of purchase, the continents from which our nation buys goods.

33. Name, in order of purchase, the nations on each continent from which the United States buys goods.

34. Name the continents to which the United States sells her goods, in the order of sale.

35. Name the nations on each continent to which the United States sells goods, in the order of sale.

36. What are two kinds of commerce according to trade?

37. What are two kinds of commerce according to transportation? *Ans.*, Land and water commerce.

38. What is a pack-train, where used, and what animal is usually its beast of burden?

39. What is a burro?

40. What is a llama?

41. What elements have greatly assisted in developing a good home market and a lucrative foreign trade?

42. Explain how all industrial classes may be affected by a good commerce in a nation.

43. Can you name a city in our nation that is largely dependent on the pack-train for its supplies?

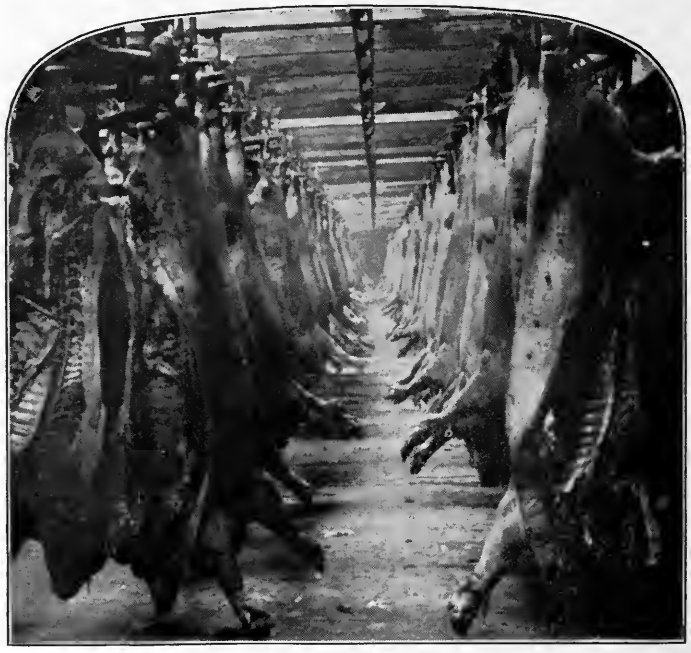
44. Name the ten greatest commercial powers, in order of commerce.

45. Who were the first commercial people of history? *Ans.*, The Phœnicians, who were missionaries of commerce and disseminators of civilization.

46. Fill in amount in thousands of dollars in the following table:

COMMERCE BETWEEN THE UNITED STATES AND THE FIFTEEN LEADING COMMERCIAL NATIONS OF THE WORLD.

1.	Exports, $..... Imports, $.....	9.	Exports, $..... Imports, $.....
2.	Exports, $..... Imports, $.....	10.	Exports, $..... Imports, $.....
3.	Exports, $..... Imports, $.....	11.	Exports, $..... Imports, $.....
4.	Exports, $..... Imports, $.....	12.	Exports, $..... Imports, $.....
5.	Exports, $..... Imports, $.....	13.	Exports, $..... Imports, $.....
6.	Exports, $..... Imports, $.....	14.	Exports, $..... Imports, $.....
7.	Exports, $..... Imports, $.....	15.	Exports, $..... Imports, $.....
8.	Exports, $..... Imports, $.....		



A Half-Mile of Pork, Armour's Great Packing House, Chicago, U.S.A

CHAPTER II.

The Food Commerce of Nations.

Food commerce is the greatest commerce of the world. For this reason it will be interesting and instructive to study the production and consumption of a variety of foods. The data given in this chapter are drawn from Government sources and from Mr. Geo. W. Waldron's magazine article on "The World's Bill of Fare."

The very largest food crop is the potato crop, that at present writing is estimated to be four billions of bushels annually. Seven-eighths of this crop is raised in Europe, and the United States raises one-half of the remaining one-eighth of the crop. The greatest consumers of this crop are named below, the figures indicating the number of pounds per capita per annum.

Irish	1,467	Austrians	663
Germans	1,300	Canadians	660
Dutch	840	Russians	481
Norwegians and Swedes	740	English	238
French	700	Americans (U. S.)	200
		Italians	48

While the Irish are the greatest potato-eaters, the Germans are the greatest consumers, using annually one-fourth of the world's crop.

The world's grain crop is made up as follows:

Wheat	2¾	billion bushels.
Oats	3⅕	" "
Corn	2⅖	" "
Rye	1⅗	" "
Barley	⅕	" "

This lists the cereal food for man and beast, almost eleven billion bushels, although the millions of pounds of rice used in Western as well as Oriental lands is yet to be added to complete the total amount.

The ten great wheat regions of the world are here given, with their product indicated for 1899 in millions of bushels:

1. United States	*547	6. Italy	138
2. Russia	487	7. Germany	141
3. France	366	8. Argentina	92
4. British India	233	9. Spain	88
5. Austria	190		

Over 87½ per cent. of the world's wheat crop is supplied by these ten regions. Fully one-half of the world's wheat is raised in Europe, yet it imports one-half of all exported wheat from other continents.

The most important wheat-consumers are as named below. The numbers indicate the pounds per capita per annum.

1. French	467	6. Dutch	240
2. Canadians	360	7. Austrians	230
3. Italians	307	8. Germans	180
4. English	250	9. Russians	93
5. Americans (U. S.)	240	10. Japanese	†22

The leading nations using rye flour are:

Danish	320 lbs.	French	53 lbs.
Swedes	314 lbs.	Italians	29 lbs.
Russians	307 lbs.	Germans	26 lbs.
Norwegians	224 lbs.	Americans (U. S.)	22 lbs.

The oatmeal-eaters are:

Norwegians	112 lbs.	Americans (U. S.)	70 lbs.
Germans	97 lbs.	Spanish	55 lbs.
Swedes	96 lbs.	Italians	46 lbs.
Dutch	96 lbs.	Austrians	45 lbs.
Russians	90 lbs.	Canadians	51 lbs.
Belgians	74 lbs.		

*Nearly 25 per cent. of entire crop.
†Increasing rapidly.

The Scotch are among the heaviest oatmeal-eaters, but there are no reliable data as to amount consumed apart from the rest of Great Britain, which on the whole consumes but 12 pounds per capita.

The cereal rice is most largely used by the Chinese and Japanese, who require 300 pounds per capita; East-India people, 200 lbs. (the province of Bombay uses 547 lbs.); the Italians, 14 lbs.; English, 9 lbs.; Spanish, 5 lbs.; and Americans (U. S.), 4 lbs.

The New World raises nearly all the world's corn, four-fifths of the crop being produced by the United States. Here, it is largely used to fatten cattle and hogs, although the Yankee "Johnny-cake," Southern "hoecake," and Western "corn bread" are well-known elements in our nation's bill of fare.

The people of our nation are the greatest meat-eaters, the per capita per annum being 147 pounds. We annually consume five billion pounds of beef, four billion pounds of pork, four-fifths of a billion pounds of mutton, and one and one-fifth billion pounds of fish, oysters, and fowl.

The meat schedule for the other great meat-eating nations is as follows:

English	100 lbs.	Belgians	61 lbs.
Norwegians	80 lbs.	Austrians	60 lbs.
French	77 lbs.	Irish	56 lbs.
Spanish	70 lbs.	Russians	50 lbs.
Germans	64 lbs.	Dutch	50 lbs.
Swedes and Swiss	62 lbs.	Italians	24 lbs.

The leading beef-producing regions are here named in order of rank:

1. United States	*25%	5. France	7½%
2. Russia	13½%	6. Great Britain	6%
3. Argentina	12%	7. Austria	4⅘%
4. Germany	10%		

The world's cattle, in 1900, numbered 181¾ million head (in round numbers).

The greatest pork-producing regions are:

1. United States	*56%	4. Germany	8½%
2. Austria	9%	5. France	5%
3. Russia	8⅘%	6. Great Britain	3%

*The percentages marked with a * are of the entire amount produced in the world.

Sugar Levee, New Orleans, Louisiana.

Swedes	40 lbs.	Austrians	18 lbs.
Dutch	34 lbs.	Russians	13 lbs.
French	30 lbs.	Norwegians	12 lbs.
Germans	30 lbs.	Spanish	8 lbs.
Belgians	23 lbs.	Italians	6 lbs.

The sugar used comes principally from two sources — from the sugar cane and from sugar beets. The former can be raised only in the warmer portions of southern temperate and tropical regions, with certain agreeable climatic conditions; the latter can be raised in nearly all parts of the temperate zone.

Below are given the leading cane-sugar-producing regions, with their output for 1900 in thousands of tons:

1. Java	670	4. Hawaii	320
2. Cuba	500	5. Mauritius	160
3. Louisiana	340	6. Brazil	150

Total cane-sugar output, 2850 thousand tons.

In the beet-sugar-producing regions (principal ones) the output in 1900 in thousand tons was as follows:

1. Germany	1,950	3. France	1,125
2. Austria	1,075	4. Russia	890

The world's hogs, in 1900, numbered 122⅜ million head (in round numbers).

The most important sheep-producing regions are:

1. Australia	*27%	4. United States	9½%
2. Argentina	18%	5. Great Britain	7½%
3. Russia	10%		

The world's sheep, in 1900, numbered 410 million head (in round numbers). Sheep are raised more largely for wool than for mutton.

The lovers of eggs are given below, the figures indicating the number per capita consumed by each nation:

1. Americans (U.S.),	†133	5. Germans	75
2. Canadians	90	6. Italians	47
3. Danes	80	7. English	39
4. French	78		

The lovers of sweets are indicated by the following large sugar-consumers:

English	90 lbs.	Swiss	52 lbs.
Americans (U. S.)	60 lbs.	Danes	48 lbs.

*The percentages marked with a * are of the entire amount produced in the world.

†Over ten million eggs used in 1900.

Picking the Famous Uji Tea, near Tokyo, Japan.

5. Belgium ...	340	7. U. S.....	*89
6. Holland	170		

Total beet-sugar output, 5950 thousand tons. Over 67 per cent. of the world's sugar output to-day is beet sugar, and as the regions for raising cane are circumscribed and therefore limited to a much smaller area, this per cent. of beet sugar is rapidly increasing.

The total sugar consumption in 1900 was 8,200,000 tons.

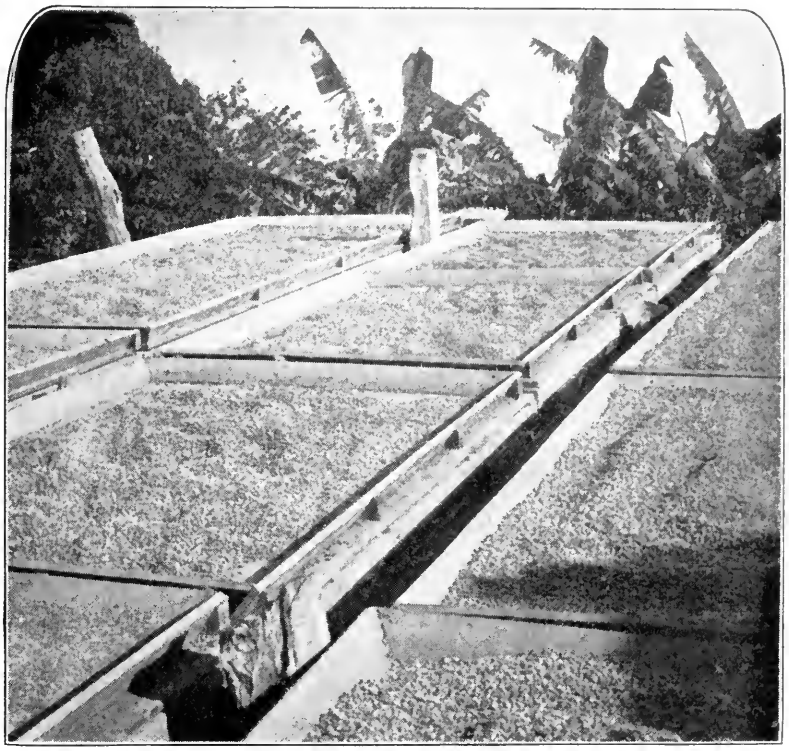
The greatest tea-drinker outside of the Orient to-day is the Englishman, who requires 88 ounces. His son-in-law, the Canadian, needs 70 ounces; Uncle Sam's children each use 16 ounces (one full pound); while the Russian uses but 9 ounces.

The very heaviest coffee-drinker is the Netherlander, who requires 247 ounces — nearly 15½ pounds — each year. The Dane gets along with 176. Each American in our Union requires 168 ounces — 10½ pounds; but our nation is so big that it takes half the world's coffee to supply us with this national breakfast beverage — *800 million pounds.* The figures for other nations are as follows:

Swiss	112 ounces.	Italians	17 ounces.
Germans	78 "	English	3 "
French	53 "	Russians	3 "
Austrians	32 "		

The greatest tea regions are found in China, Japan, and the East Indies, although this plant is now being successfully cultivated in the Western World.

The great coffee-producing region is Brazil, producing two-thirds of the world's entire crop. Venezuela, Central America and Mexico in the New World, and the East Indies and Arabia in the Eastern World supplement Brazil's output. Arabia is the home of Mocha, the most famous and best of coffee brands.



Drying Coffee, Porto Rico.

A study of the above data will show the reason why the United States is now and will continue to be an increasingly important agent in food commerce. We see that our nation is a granary for the world as well as the great butcher-shop of the nations, her meats — fresh, salted and canned — being sent in one or all forms to every meat-consuming nation on the globe.

From the published governmental reports for our nation's commerce for the year 1900, we glean the following interesting facts about our nation's food commerce.

Most school children know that the leaf of a semi-tropical plant gives us our tea, that the berry of a tropical plant is our coffee, that chocolate is prepared from the roasted bean of the cacao tree,

*Rapidly increasing.

while the shell of the cacao berry or bean furnishes the cacao or cocoa shells of commerce.

But many are surprised to learn that impurities are added between the field where grown and the table where served, to such an extent that a chemical analysis has revealed that in some instances only 60 per cent. of the article bought is from nature, the rest being the product of that artist who taught the trader (not the Yankee from Connecticut) how to make wooden nutmegs that defy detection. We learn that this artist now makes clay coffee berries, colored with tan-bark, and substitutes them for some of the genuine, as the coffee passes him on the way to our breakfast-table. Thus we may grind the coffee, and, boiling it, have genuine "muddy" coffee.

In a similar manner our food artist adulterates chocolate with a preparation of mutton tallow, cheap sugar, shells of the cacao bean, sawdust, and potato meal. When all is ready a rich chocolate brown is given with ochré, and mixed so thoroughly with that fresh from the roasted bean that most of us are ignorant of the deception.

This trade artist stirs the tea, takes toll out of the flour barrel while he covers the damaged flour with mineral salts, "doctors" our syrups, *makes* much vinegar, and even leaves his trade-mark in the cheap candies consumed in car-load lots by Uncle Sam's children.

These food adulterations have led to the careful inspection of all food shipped out and food sent into a commercial nation. The counterfeiting of money is as nothing compared to this counterfeiting of pure wholesome food products.

The Celestial trader, the Japanese dealer and the East-Indian merchant employ the food artist quite as much as the proverbial "Yankee grocer," who is reported to sand his sugar, doctor his vinegar, and make his syrups. Although legislation seeks to protect the consumer from this nefarious tampering with the necessaries and luxuries in food commerce, yet the deceptions are often so complete as to deceive sight, taste, and smell.

Uncle Sam imports the following-named food elements principally from the countries indicated below:

(The names of foods, and the names of countries from which imported, are here given in order of purchase.)

1. *Sugar.*— Dutch East Indies, Hawaii, Cuba, Germany, British West Indies, British Guiana, Santo Domingo, Porto Rico, Brazil, Peru, and Philippine Islands.

2. *Coffee.*— Brazil, Venezuela, Mexico, Dutch East Indies, Guatemala, Costa Rica, and Colombia.

3. *Fruits and Nuts.*— Italy, British West Indies, Spain, Costa Rica, Colombia, France, and Greece.

4. *Tea.*—China, Japan, and British East Indies.

5. *Fish.*— Canada, France, Great Britain, Netherlands, Sweden and Norway, and Portugal.

6. *Cacao Shells and Chocolate.*— British West Indies, Dutch Guiana, Ecuador, Brazil, and Portugal.

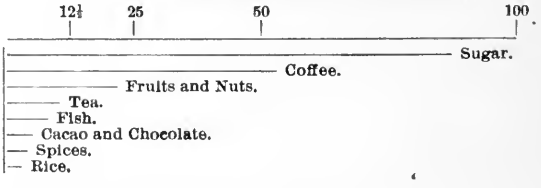
7. *Spices.*— British East Indies, Great Britain, Netherlands, Dutch East Indies, China, Hong Kong, and West Indies.

8. *Rice.*— Germany, Japan, China, and Great Britain.

(Many tropical fruits sent from Great Britain, Germany and Netherlands come to them from their tropical colonies, and are by these nations shipped to consumers.)

DIAGRAM SHOWING RELATIVE PROPORTION OF FOODS IMPORTED IN 1900.

(The figures indicate value in millions of dollars.)



Our nation exports the following foods in order of importance as named, principally to the nations given below. (For year 1900, in million dollars.)

1. *Breadstuffs.*— $262\frac{3}{4}$, to Great Britain, Germany, Netherlands, Belgium, Denmark, Canada, Sweden and Norway, Hong Kong, Portugal, France, West Indies, and Japan.

2. *Meat Products.*— $175\frac{1}{4}$, to Great Britain, Germany, Netherlands, Belgium, Cuba, France, British West Indies, Sweden and Norway, British Africa, and Italy.

3. *Fruits and Nuts.*— $11\frac{5}{8}$, to Great Britain, Canada, Germany, Netherlands, France, Belgium, and West Indies.

4. *Dairy Products.*— $9\frac{1}{4}$, to Great Britain, Cuba, Canada, Brazil, Venezuela, Japan, and Hawaii.

5. *Fish and Oysters.*— $5\frac{1}{2}$, to Great Britain, West Indies, British Australasia, Canada, Brazil, and Mexico.

6. *Glucose or Grape Sugar.*— $3\,^3/_5$, to Great Britain, Canada, British, Australasia, Belgium, Sweden and Norway, and British Africa.

7. *Vegetables.*— $2\,^4/_5$, to Cuba, Great Britain, Canada, Hawaii, and Porto Rico.

8. *Eggs.*— 1, to Cuba, Great Britain, British Columbia, Hawaii, Germany, Mexico, and British Africa.

The quantity of our food exports is increasing each year, while the quantity of our food imports is being perceptibly lessened. In a few years our nation can raise all her sugar, and through its island dependencies obtain a great deal of the nation's tea, coffee, cacao, spices, and the million and a half dollars' worth of rice that is now annually imported. Our sale of food products is rapidly increasing in the Oriental countries, while European countries continue to use their full quota and increase their orders for meat products.

Let us realize that our cereal exports exceed any other nation's cereal exports by many millions; that our meat exports are second only to our cereals. Fast transportation, refrigeration and improved methods for preserving meats have opened up new markets for American pork, beef, mutton, and poultry, as well as American fruits. It is confidently believed that the completion of the Trans-Siberian Railway and the digging of the Panama or Nicaragua Canal will mean millions of dollars to food commerce. Cost of transportation will be lessened, the improved quality of certain foods will multiply the orders, and all food-producing nations will profit thereby.

The two nations that stand ready to derive the greatest benefits from these shortened routes are the two that now very nearly supply all food demands at home, lying on opposite sides of the Pacific,— Australia and the United States.

Blossom and Fruit of the Cacao Tree, Hope Gardens, Kingston, W. I.

QUESTION SUMMARY.

1. What fact shows the importance of food commerce?
2. What is the greatest food crop, and where is the larger part of it raised?
3. Name the greatest consumers of this crop.
4. What nation uses one-fourth of the world's potato crop?

Husking the Crop in a Cocoanut Forest, near Mayaguez, Porto Rico.

5. Name the grains that furnish the cereal foods for man.

6. Name the greatest wheat regions of the world, in order of rank.

7. Name the most important wheat consumers, in order of rank.

8. Name the leading nations using rye as a food.

9. Name the world's oatmeal-eaters.

10. What nation in a cold climate heads the list?

11. What nations raise the greatest amount of rice, and by what people is it most largely consumed?

12. What nation produces four-fifths of the world's corn crop?

13. What nation of people require nearly 150 pounds of meat per capita each year?

14. Enumerate our nation's meat bill.

15. Name, in rank, the ten greatest meat-eating nations.

16. What proportion of the world's beef does the United States produce?

17. What proportion of the world's pork does our nation produce?

18. What nation raises more than one-fourth of the world's sheep?

19. What nations do you think lead in the production of wool?

20. What is the approximate yearly consumption of eggs by the nations named in the text? *Ans.*, Multiply the population of each nation named in the list (seven in all) by the number of eggs per capita, and add the products.

21. Name the ten greatest sugar consumers.

22. Name the five greatest cane-sugar-producing regions.

23. Name the five greatest beet-sugar-producing regions.

24. Why is the quantity of beet sugar greater than the quantity of cane sugar?

25. What parts of the United States seem best adapted to sugar beets?

26. Locate some large sugar-beet factories now in operation.

27. Where are the great tea regions?

28. Name the greatest tea consumers.

29. Name the coffee regions of the world.

30. Name the greatest coffee-consuming nations.

31. What nation uses the largest amount of coffee per capita?

32. What nation consumes half of the world's coffee?

33. What nation is the greatest factor in food production? *Ans.*, United States.

34. What nations on what continent are the greatest food-buyers?

35. Why is corn meeting with much favor as a food in thickly settled regions of Europe? *Ans.*, Corn meal can be mixed with rye or wheat flour, giving a cheaper yet very nutritious food for the peasantry of Belgium, Germany, Holland, Austria, and France.

36. Where are Western cereals and meats being introduced with gratifying success? *Ans.*, Japan and China.

37. What is the tea of commerce?

38. What is the coffee of commerce?

39. What is chocolate? Where obtained?

40. How are tea, coffee and chocolate adulterated?

41. What is the chief duty of the Government food inspector?

42. What ten regions send us sugar?

43. Name five regions from which we import coffee.

44. Name five countries that send us fruits and nuts.

45. Name the eight most important food products imported by our nation.

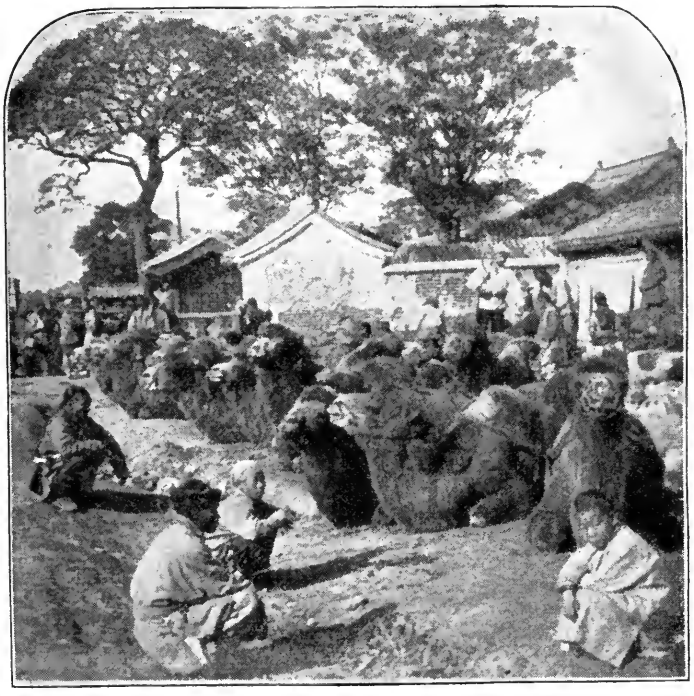
46. Name the eight most important food products exported by our nation.

47. Where is our nation finding new markets for food products? How do you account for this?

48. What will be the effect of a Central-American canal upon food commerce?

49. Why will Australia and the United States lead the commercial nations in the benefits derived from this canal?

50. Name the nations engaged in food commerce with the United States, and indicate the ports of our nation through which this commerce passes.



China's "Common Carrier"—Her Substitute for Railways—a "Camel Square" in Peking, China.

CHAPTER III.

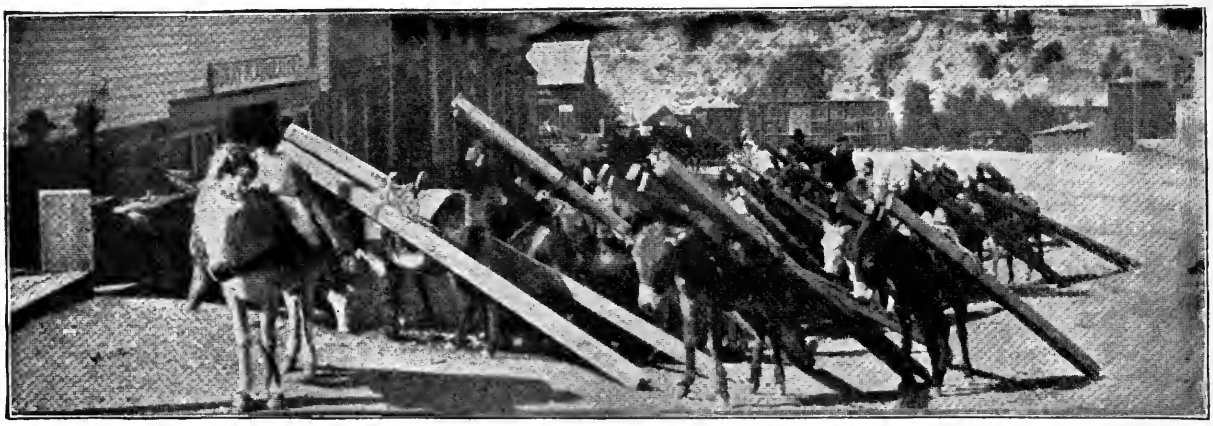
Overland Commerce.

The pack-train, caravan, stage, and wagon-freighter have been the world's chief means of overland commerce. The pack-trains of North and South America were described in a preceding chapter as now being confined to the inaccessible regions for stage, wagon-freighter, or the railroad. No long stage routes at present exist, while a generation or two ago there were stage and "freighter" routes several hundred, and in some instances more than a thousand miles long. To-day a hundred-mile stage route can scarcely be found, for the railroad has supplanted the stage all over the world. Only in mountainous districts or thinly populated regions is the stage and wagon-freighter known as an instrument or means of important commercial intercourse.

One of the features of Col. Cody's ("Buffalo Bill's") Wild West Show is an old-time stage-coach of the plains. The fact that this very common vehicle of trade and travel forty years ago is to-day a curiosity and carried around in shows, teaches us the development and general adoption of modern and more rapid means of transit.

The most important vehicle of overland commerce is the caravan. A company of merchants, travelers or pilgrims, who for greater security associate themselves together in travel, is called a "caravan." Robbers lurk in the vicinity of trade routes across deserts and arid areas, and so many dangers threaten the commercial traveler that so far back as overland commerce existed or authentic history runs, the caravan has been one means of trade intercourse across the arid lands of Africa and Asia.

Mohammed, in the seventh century A. D., enjoined his followers to visit Mecca at least once in a lifetime. For this reason, Mecca became the Holy City of the Islam world. During the centuries that have followed, adherents to this faith have implicitly obeyed this injunction, and large caravans of pilgrims have at stated times assembled in countries where the Mohammedan faith has been established. The most celebrated of these pilgrim caravans assemble at Cairo and Damascus. The latter is the larger caravan, and in the days of the Saracenic Empire frequently consisted of from thirty thousand to fifty thousand pilgrims. The caravan by which the Moslem pilgrims from Persia travel starts from Bagdad, and, we are told,



Lumber for the Gold Belt, Ouray, Colorado.

is the vehicle of a very important trade. In former years a very important caravan gathered at Muscat and proceeded thence to Mecca. For many centuries these four caravans made regular pilgrimages to the holy city of the Moslem faith, under the protection of the Sultan of Turkey. When the caravans arrived bringing goods from all quarters of the Eastern world, Mecca appeared like a great fair, a rival to the Novgorod of modern days.

The Muscat, or "Indian" caravan, as it was called, has long since been abandoned, but the Cairo, Damascus and Bagdad caravans still make pilgrimages to Mecca, forming important means of trade between southwest Asia and northeast Africa. Modern Mecca, like ancient Mecca, depends upon the pilgrimages for its existence, although the number of pilgrims is now reduced to forty or fifty thousand a year.

Trade between Tripoli and central Africa is carried on exclusively by caravans. This route runs across the Sahara desert and through the Soudanese plains. The trade between Darfur and Egypt is a caravan trade. Darfur is rich in cereals, copper, and iron. Tobacco is a staple product here, and is used in every form by both men and women. Quantities of tamarinds, dates and watermelons are also grown in Darfur. These products are exchanged for the durra, barley, cotton and indigo of Egypt.

These caravan routes crossing the Sahara seek stations at as many oases as possible. Frequently terrific sand-storms overtake the caravan of this desert, and instances are on record of whole caravans being covered up, entombed by the sand.

The mirage of the desert is a well-known illusion to the experienced trader, but the unwary are frequently deceived, decoyed away and lost.

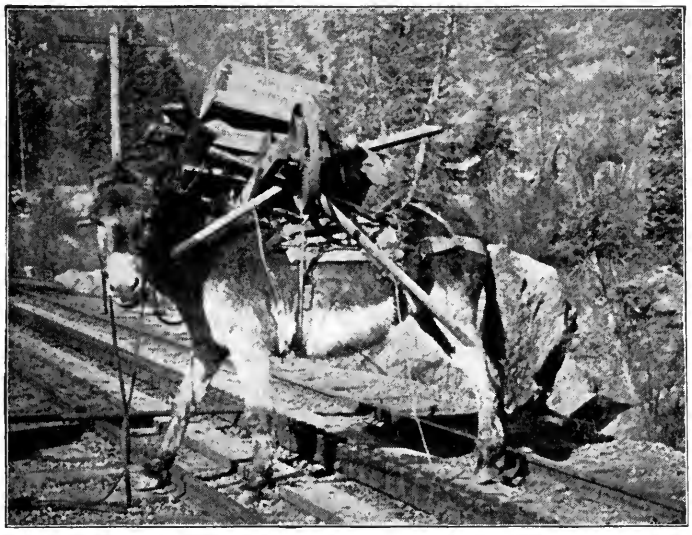
The great trade between Russian Asia and China is largely a caravan trade, one route extending west to Moscow. The Trans-Siberian Railway is now supplanting many of these Siberian caravan routes.

The trade caravan has its definite route, regular stations, and stated time limits to "make" each station. It starts at a certain hour and day, and hence runs on schedule time.

The leader of a trade caravan is called the Karwan-Baschi, and is usually elected by the merchants from their own number.

The beast of burden is usually the camel, chosen for its great endurance and ability to go without water for long periods — even five to nine days at a time. Because of its stately and steady tread and its universal use, the camel is frequently called the "ship of the desert." A caravan sometimes has more than a thousand camels following one after another in single file. Such a caravan is more than a mile long.

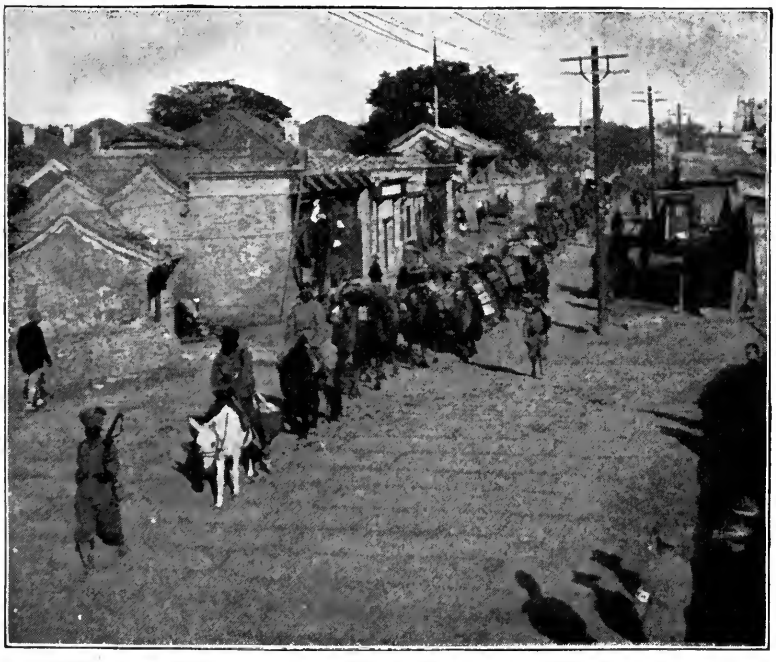
When the camels have a load weighing from five hundred to six hundred pounds, we have a heavy caravan that can travel only from fifteen to eighteen miles a day. A light caravan can travel from twenty-two to twenty-five miles per day, as the camel's load is not over three hundred and fifty pounds.



The Mountain Carrier.

QUESTION SUMMARY.

1. What is meant by overland commerce?
2. What is a pack-train? What animals are most largely used for this purpose? Why?
3. What is a "freighter"? Can you name any place where now in use?
4. Why are stage routes fewer in number and shorter than in former years?
5. Name a stage route now in operation.
6. Define a caravan.
7. Why is Mecca an important center of caravan routes? Locate this city.
8. Who was Mohammed?
9. Name important commercial cities connected with Mecca by caravan.
10. Which Pilgrim caravan has been the most important route?
11. Give some facts about the Indian caravan.
12. Mecca is likened to what city? Where is this city and what can you say about it?
13. Discuss the Tripoli caravan.



One of the Typical "Freight Trains" that Carry China's Home Commerce—Caravan Leaving Pekin.

14. A few score years ago, this was one of the greatest slave-trading routes in the world. Why is this not profitably carried on at the present day?
15. Where and what is Darfur?
16. With what country does it trade?
17. What products are exchanged?
18. What is durra?
19. On what kind of tree do dates grow?
20. Tell the comparative area of the Sahara desert.
21. What are some of the theories that account for this vast arid waste?
22. What plans are now being laid to reclaim this arid waste? *Ans.*, Plans are being perfected for canals that shall let the sea in, it being believed that this will restore vegetation, making the desert a great oasis instead of a sandy waste.
23. What can you say of the Siberian caravan routes?
24. Name the most important caravan routes of to-day.
25. Why is the camel most generally used in caravans?

A Mountain "Baby."

26. Who is the Karwan-Baschi?
27. What is a heavy caravan?
28. Define a light caravan.
29. What is meant by a caravan schedule?
30. In what parts of the world is overland commerce now carried on?

CHAPTER IV.

Railroad Commerce.

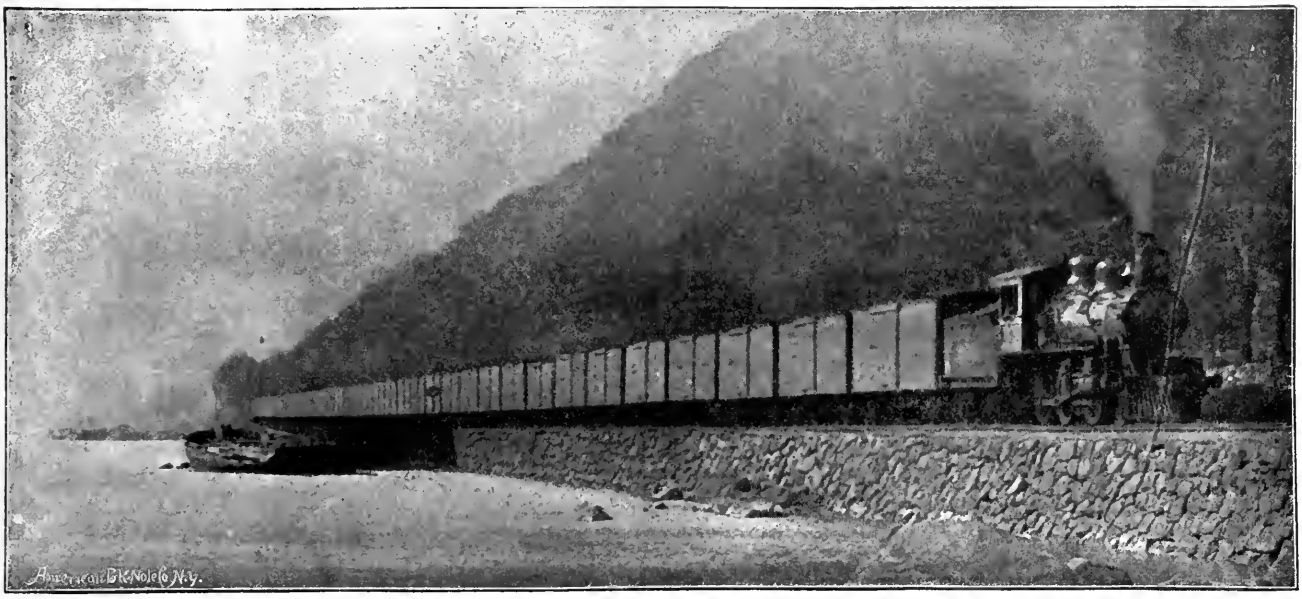
To-day the chief agent of land commerce is the railroad. It has been well said that railroads have been the greatest civilizing agency of the nineteenth century, for they have stretched their iron bands from town to town, crossed the widest rivers, threaded valleys, climbed mountains, tunneled a way through inaccessible cliffs and peaks, and shown their great value as a transporting agent in every department of commerce. The railroad has taught dilatory people many wholesome lessons on punctuality, while it has been a great friend of human progress and industrial development.

It was James Watt, of Scotland, who made the first application of steam as a motive power, but it was George Stephenson, of northern England, who built the first locomotive. This locomotive was built in 1814, and had a speed of six miles an hour. Stephenson and Booth built the "Rocket" in 1829. This locomotive weighed four and one-quarter tons, and had a speed of thirty-five miles an hour. Tramways — wooden railways for four-wheeled vehicles — had been used in the collieries of England since 1672, when Mr. Beaumont constructed a tramway at the Newcastle-upon-Tyne collieries. The first railroad for locomotive service was the Stockton & Darlington Railroad of England, built by Edward Pease and George Stephenson in 1825. The first railroad in America was the Quincy Railroad, built from the Quincy (Mass.) quarries to the nearest tide-water. This Quincy railroad was projected by Gridley Brant, a civil engineer, and in 1826 Col. T. H. Perkins and Mr. Brant completed the road. This first railroad of America was four miles long, and cost fifty thousand dollars. It was supplied with the first turntable ever used, devised by Mr. Brant, and still in use as late as 1880.

The second American railroad was laid from the Mauch Chunk (Penn.) mines to the Lehigh river, a distance of thirteen miles. This road was opened for use in 1827.

The third American railroad was the Baltimore & Ohio Railroad of to-day, and was the first railroad authorized to carry on a general transportation business. It was begun July 4th, 1828, and was to extend to Ellicott's Mills, thirteen miles

Grand Central Station, New York City, N. Y.



Train of Commerce—100 cars on New York Central Railroad.

away. It was soon completed to the Potomac, following the valley to the Cumberland coal region, and in a short time was extended across the mountains to Wheeling, on the Ohio river.

The first locomotive built in America was made in Baltimore, by that grand good man who later in life founded an institute in New York city where poor boys might get an education and learn a trade — Peter Cooper. This locomotive was small, had an upright boiler, and could not have weighed more than a ton, yet it drew an open car carrying the directors of the railroad from Baltimore to Ellicott's Mills. This was in 1830, and we are told that it was the first time a locomotive was used for passenger service, on either side of the Atlantic. Its speed was rated at eighteen miles an hour. Little did Peter Cooper know what a wonderful element of commerce he had started. This same road now links New York, Philadelphia, Baltimore, Washington and Chicago together, where engines from fifty to ninety times larger than Cooper's draw long trains of commerce upon its ribbons of steel.

The advent of the railroad was so important to the commercial world that it will be interesting and instructive to study the cost and character of the different cars of freight and passenger traffic.

Passenger engines vary greatly in size and weight as well as mechanism, but generally speaking weigh from thirty to seventy-five tons. Freight engines weigh from forty to ninety tons. The larger engines are rapidly displacing the lighter engines, as the heavier power will haul greater tonnage. An engine weighing ninety tons, on a level can haul a load of four thousand five hundred tons; but as it is difficult to haul such a tonnage in one train, and as but very short distances of railroad track can be level, the engine is seldom worked to its maximum power.

We are told that the life of a locomotive depends upon the conditions of the service. Where water is impregnated with sulphates and other deleterious or corroding matter, the life of a locomotive boiler is short,— sometimes not longer than ten years. In good water the life of a boiler would be twice this period. The number of miles' service and the care given the engine tend also to lengthen or shorten its life; so you see that even the approxi-

mate life of an engine is very hard to determine. The cost of an engine is also quite as varying, dependent upon the make of engine, weight, quality of material, together with present price. Lighter engines in 1900 cost from $9000 to $12,000, and heavier engines from $12,000 to $15,000.

Cars in the freight service are divided into a number of groups. Cars used for hauling coal, sand, cinders, heavy iron and timbers, with simply a bottom and low sides, are called flat cars, and cost from $250 to $600 and $700, according to capacity and material used. Cars with solid bottom and cover, but with slat sides, adapted to hauling stock, are called cattle cars, and cost from $600 to $1000. Refrigerator cars are made on the principle of an ice-house, with double sides padded with material impervious to heat. These cars are especially adapted for hauling meats, fruits, and cold-storage merchandise. Their cost varies from $700 to $1250, owing to their dimensions. The ordinary grain or box car costs from $550 to $800. The freight caboose, or trainmen's car, costs from $500 to $1000.

Many railroads are now using cars made of steel — block steel being used in place of wood as a building material. That these cars are made of incombustible material renders them longer lived and reduces the chances for damage to freight in a wreck or collision.

Let us now look at the passenger service a moment. A mail car ranges in price from $2500 to $6000, according to dimensions and material used. Baggage cars cost from $2500 to $4000; chair cars, $3000 to $8000; Pullman, $10,000 to $20,000.

From the above figures we can make an approximate estimate of the cost of a train of cars, either freight or passenger.

When we realize that the lowest estimated cost of making a mile of railroad track on *level ground* (fifteen ties per rail-length) is $8000, we can form some estimate of the enormous expenditure of money the railroad commerce of the United States of to-day represents. Statistics show that the United States has fully 190,000 miles of railroad, the average cost of which, with bridges, is upward of $59,000 per mile. The estimated cost of tracks and rolling-stock in our nation alone is not less than 10,000 millions of dollars. All this vast outlay is later covered by the revenues of commerce.

The auditing department of a great American railroad system rivals a Government department.

The earnings of the Pennsylvania System in a year average about 130 millions of dollars; the Vanderbilt System — New York Central, Lake Shore, West Shore, Nickel Plate, Michigan Central, Boston & Albany, and Pittsburg & Lake Erie railroads — upwards of 137 millions of dollars. The total receipts of the Federal Government for the year 1896 are given as follows:

Customs	$150,000,000
Internal revenue	146,000,000
Total	$296,000,000

This represents the Government receipts for a nation of 75,000,000 people, but the two railroad systems referred to above represent receipts to the amount of $267,000,000. If a third system — the Santa Fe — be added, the Government receipts would be exceeded.

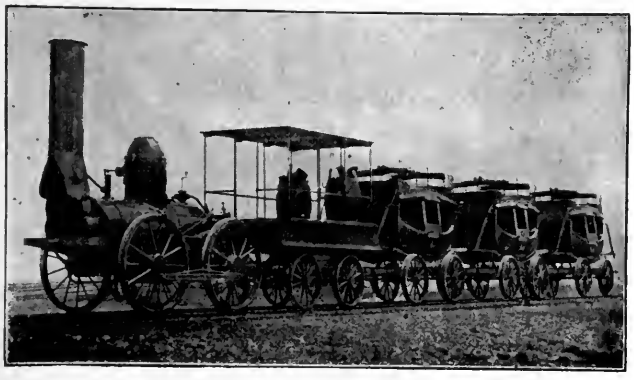
When one realizes that there are upwards of forty different railroad coöperations in our nation, he can begin to form a conception of the tons upon tons of freight as well as express handled by our railroads.

The trunk lines of the United States are to-day great arteries of commerce, which, with their tributary lines, form a complete system of trade circulation, reaching to all parts of our great nation. Where it took a good week to travel from New York to Buffalo, the Empire Express now transports one from New York to Buffalo in eight hours and fifteen minutes, a distance of 440 miles. One can buy a through ticket from New York to San Francisco, board the train at New York Monday

morning, and Thursday night eat supper at San Francisco. The passenger can eat his meals in a palace diner, take his bath, read his book, write his letters, read the news, and receive every other convenience of a modern home while being transported through the country at from forty to sixty miles an hour. Undoubtedly the greatest railroad in our nation from a commercial standpoint is the New York Central, that has four tracks from Buffalo to New York, and in the busy season of the year runs from seventy-five to one hundred trains daily. (Three hundred and twenty passenger trains leave the New York depot daily.) It is no unusual thing for a single locomotive to haul through the Mohawk Valley over this road ninety thousand bushels of grain. This is the pioneer railroad of New York, its first train, in 1831, making regular trips from Albany to Schenectady. (See cut below.)

The mileage of the New York Central in 1900 was 2294 miles, but it is the only four-track railroad in our nation, and forms the direct connection between the rail and lake port of Buffalo and the Atlantic seaboard, hence its commercial importance.

The greatest railroad in mileage and amount of business is perhaps the Pennsylvania System with its 10,500 miles of track, and connecting the great trade centers of New York, Philadelphia, Baltimore, Pittsburg, Buffalo, Cincinnati, Cleveland, Toledo, Chicago, Indianapolis, and St. Louis.



DeWitt Clinton Express.
(The first steam railway train in the State of New York.)

The Empire State Express (in 1902).

The first railroad to connect the East and the West was the Union Pacific, completed in 1869. To-day we have five transcontinental lines in our own nation, and with the Canadian Pacific, six transcontinental railroads in America.

The most picturesque and remarkable railroad enterprise of recent years is the Alaskan Railway, that extends from Skagway, in the northwest part of Alaska, over the White Pass to Lake Bennett, British Columbia. It is called the White Pass & Yukon Railroad. It was built in the winter-time, with the thermometer ranging between thirty and fifty degrees below zero, and its completion is a monument to the untiring energies of Mr. E. C. Hawkins. Although the road is only forty miles long, its construction would scarcely be paid for if the entire road-bed have a layer of five-dollar bills laid end to end, from Skagway to Lake Bennett.

Probably one of the clearest illustrations of engineering skill in recent railroad building is shown in the construction of the tunnel through the Cascade Mountains on the Great Northern Railroad.

On Saturday, September 8, 1900, Galveston, Texas, as well as the surrounding country, was overwhelmed by a West-India hurricane. The first aid came to the stricken city from the railways. The Rock Island started a train of supplies from Chicago, while the South Texas lines, the M. K. & T. and the Santa Fe joined in the urgent work

or reopening means of transportation, bringing in supplies and transporting refugees. In twelve days the tracks that had been swept away for miles had been restored, a two-mile bridge had been built across the bay, and regular communication between Galveston and the world resumed. This shows the power of railroads as rebuilders.

Outside of the United States the railway mileage in 1900 was estimated to be 234,647 miles. Baden, Brazil, Brunswick, Bulgaria, Ceylon, Columbia, Finland, Roumania, Russia, South-African Transvaal, South Australia, Tasmania, Venezuela and Victoria own their entire systems of railway.

Forty-two countries have public railways, aggregating 147,000 miles, while twenty-nine have private lines.

The railway mileage by continents January 1, 1898, was as follows:

1. North America (United States, 190,000)	211,000
2. Europe	163,000
3. Asia	31,200
4. South America	27,000
5. Australia	14,500
6. Africa	10,000
Total	456,700

In North America we find that the United States has the greatest railway mileage; Canada second, with her great transcontinental line, the Canadian Pacific, and its numerous connecting lines; and Mexico third, with the Mexican Central, Mexican National and Mexican Southern railroads connecting her capital commercially with all parts of the republic, and the Interoceanic Railroad with its tributary lines, connecting Pacific and Atlantic seaboards. In South America, the Argentine Republic ranks first, with many important lines connecting the metropolis of the continent — Buenos Ayres — with all parts of the republic. Brazil ranks second, most of its lines connecting Atlantic ports with one another and the coffee districts and diamond fields with the coasts.

Germany has more railways than any other European nation, with France, Russia, Great Britain, Austria, Italy, Spain and Sweden following, in the order named.

In Asia, India leads, and Siberia, Japan and Turkey in Asia follow, in order given.

Miscellaneous Data on Railroads.

It will be interesting to the student to know of some of the most important railroads surveyed and now being constructed, or whose construction will be entered upon in the near future. We will speak of the five that to-day are looked upon as feats of great engineering skill. First is the Trans-Siberian road, that is expected to reduce the time for the world trip from sixty-five to less than thirty days.

As far back as 1858, that great Russian statesman, General Muraviof, urged the building of a railroad to quicken passage to ports of Tartary. The completion of the Ural Railroad in 1880 from Perm, in Russia, to Tiumen, in Siberia (on the Tobal river), revived the discussion of a transcontinental line.

The cost of a Siberian route to the ocean was discussed, different routes surveyed, and finally an imperial order came, March 17th, 1891, for plans for construction of a Trans-Siberian railroad to be formed and work upon the road to begin as soon as practicable. The first work on this great road was begun at its eastern terminus — Vladivostok, May 12, 1892. The work progressed slowly up to 1895. Two reasons can be assigned for this: lack of general interest in the project, and tardy concessions; also, lack of modern machinery for carrying on the work. A New York engineer introduced American construction machinery and American methods, which caused a lively trade in railroad supplies to spring up between the Russian Government and America, and likewise gave impetus to the work. About the same time the concessions made to Russia by China, at the close of the Chinese-Japanese war,

put new energy into the construction work, and the near future will see the road completed.

Russia entered into a contract with China, in 1896, to build a railroad through the province of Manchuria. The railroad when completed is to have a Chinese president, and after eighty years the entire ownership of the road is to pass to the Chinese Government on payment to the Russian Government the market value of the railroad.

In 1898 Russia leased Port Arthur and the peninsula—the Liao-tung—upon which it stands. This gives Russia a very valuable Pacific port, open all the year. This road begins 53 miles east of Chita, and runs southeast 600 miles to Harbin, which station is 500 miles from Vladivostok, and is connected with it by rail.

The Chinese Eastern crosses the Sungari at Harbin, and, turning south, continues in a direct course, 650 miles, to Port Arthur. This will be an important part of the main Siberian line. The Trans-Siberian Railroad has its official European starting-point at Cheliabinsk, within the Ural Mountains.

The Eastern Chinese Railway is the Port Arthur route, and is under a separate management.

The time from London to Hong Kong via Suez Canal is twenty-five days; via the Canadian Pacific Railroad is thirty-three days; via the Trans-Siberian Railroad the time will be still less. The stations on the road are neat and comfortable, no two alike, and compare favorably with the very best depots and station-houses in Europe and America. The traveler soon realizes that a railroad restaurant along this road is one of the luxuries of travel, and that a great feast can be enjoyed in handsome dining-rooms at reasonable rates.

This road crosses the great rivers of Siberia at or a little below the head of navigation, thus making possible extensive water as well as land commerce. Together these indicate the establishing of new and large commercial cities.

Second, we will name the Cape to Cairo Railroad, of Africa. This is the last continent to be opened to modern civilization aod trade. This road is divided into four great construction sections, as follows:

1st Division — Cape Town to Buluwayo — 1360 miles. This is now completed and in operation.

2d Division — Buluwayo to Abercorn — 960 miles. This section is partially completed.

3d Division — From north end of Lake Tanganyika to Khartoum — 1500 miles. Now under construction.

4th Division — From Khartoum to Cairo — 1050 miles. This section is completed and being operated.

Of the total distance, all but 200 miles passes through British territory. This route is mainly along the "back of the central plateau," or through the African river valleys, often fever-infested or filled with jungle thickets, the home of the largest and most ferocious of African beasts. Five great bridges must be built over large rivers. When the first section was being built, the engineers were hurrying to get out of the way of the annual floods, and sent a rush order to English manufacturers. Word came back that it would require at least six and probably twelve months to fill the order, which called for the iron framework for the Atbara bridge. An American engineer prevailed upon the management to try an American firm for bridge iron. A Philadelphia firm sent word that the iron would be ready forty days after the order was placed,— and thus the iron-work for Atbara bridge was made by an American firm and the bridge *built* in less than four months.

When the entire Cape to Cairo Railroad is put in running order, with the lateral branch routes already planned, it will be the most unique system of railroad connections yet shown in any continent. Besides Cape Town, Cape Colony has ter-

minal branch lines reaching Port Elizabeth, East London, and Port Alfred.

Natal was the fourth branch line running to Durban, the Delagoa Bay Railroad is the fifth, and the Beird Railroad is the sixth one now completed, while the Ujiji & Bagamoyo Railroad, the Uganda & Mombasa and the Berber & Suakin railroads are under construction.

The Cape to Cairo Railroad will be the spine of continental commerce, with its lateral branches on either side as ribs of trade, that shall form the basis of a mighty trade and be the means of transmitting to Africa the modern civilization that accompanies transportation.

The Sahara Railroad of the French and the West-African Railroad of the Germans will, in the new century, open new avenues of trade and reveal to Africa and the world the greatness of her resources.

Third. The Euphrates Valley Railroad deserves mention. Many years ago the great French engineer, Ferdinand de Lesseps, proposed to the Sultan of Turkey the building of a railroad,—a railroad that should reach from Constantinople to the Persian Gulf. The Sultan could not see the practical value of such an expenditure of time and cash, and we see De Lesseps bring the Suez Canal into being instead of the railroad that he the more earnestly desired to construct. England sought permission from the Porte in 1878 to build the road, but was refused. Later, Russia tried to gain a similar privilege, but still the Sultan said no.

In 1888 a Berlin bank organized a syndicate that secured concessions from the Porte for building a railroad from a point opposite Constantinople to Angora, and later to Konieh (ancient Iconium).

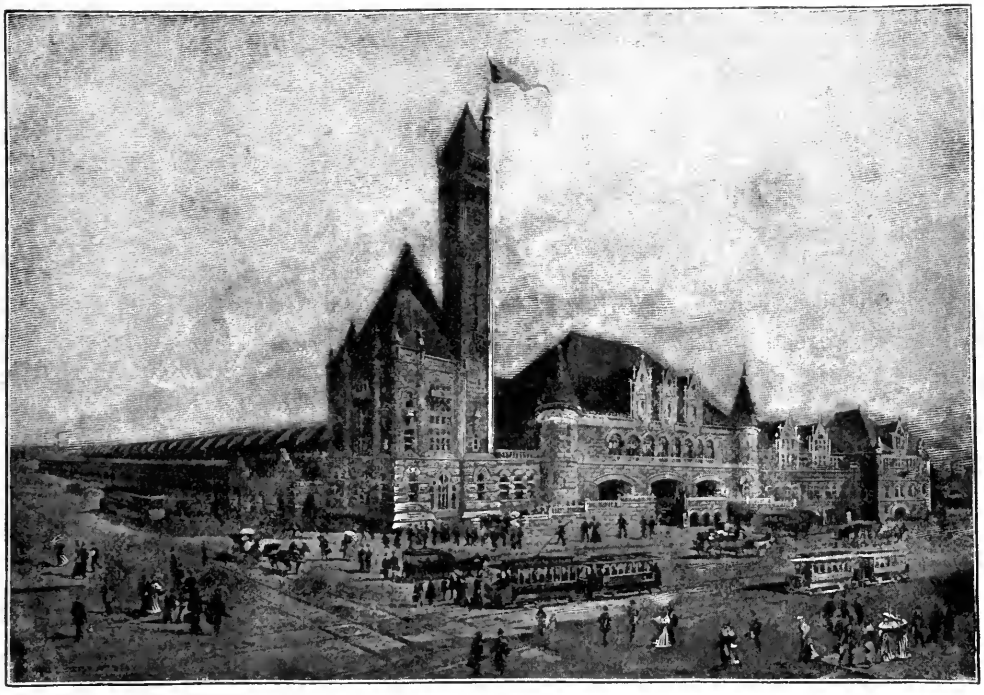
In 1892 the Antolian Railway was in operation, running trains to Angora. The German capitalists have now obtained another concession from the Turkish Sultan, permitting the building of the Euphrates Valley Railroad. This road is surveyed, and is now being constructed. It is to run from Konieh to the Taurus mountains, where it passes through the historic "Cicilian Gates" (a pass in the Taurus mountains), turns now to Aleppo, thence to Bagdad, 1000 miles from Konieh, and down the Euphrates to Bassorah, on the Persian Gulf, 400 miles below Bagdad.

The Russian Government in the last few years has completed a Trans-Caucasus railway from Batum, on the Black sea, through Tiflis, to Baku, on the Caspian sea, and from the east shores of the Caspian through Bokhara to Samarkand.

Russia has gained permission from the Sultan to construct a railway from Kars, a Russian fortress in the Caucasus, to Erzeroum, a Turkish stronghold in Armenia. Russia's policy is to push this line on west to meet the Euphrates Valley Railroad at Angora, and make rail connections east via Tabris to Teheran, the Persian capital.

Thus we see that the building of the Euphrates Valley Railroad will introduce the steam engine to all parts of historic Asia, and either cut off or cause the abandonment of the largest and most important trade caravan routes that are operated to-day.

Fourth. The London, Bombay & Hong Kong Railway is one of the boldest projects now being considered. This road, as projected, starts from London, passes through a tunnel under the Straits of Dover, south through France and Spain to the Strait of Gibraltar, under which the projected road goes into Africa. This road now turns to the east, passes through Algeria, Tripoli, Tunis, and Egypt, crosses the Suez Canal into Asia, crosses the Arabian desert and forms a junction with the Euphrates Valley Railroad near Bassorah. The road now runs through Persia and Beloochistan, skirting the Arabian sea to Bombay, and crosses India to Calcutta. The road turns up through Burmah, enters China through a pass in



St. Louis Union Depot.

the Himalaya mountains, and runs through southeast China to the coast. The road is projected to reach the coast in the vicinity of Hong Kong. This road as projected passes through the ruins of ancient Carthage, over ground traversed by Alexander's conquering army, passes by ancient Babylon, through the supposed site of Eden's Garden, and across the land sacred to the memory of all the Oriental nations of antiquity.

Fifth. The Pan-American Railway. To us this is the most important of the five named, and in length will almost equal the mileage of both the Cape to Cairo and Trans-Siberian railroads.

The Pan-American Congress of 1889 arranged for a commission to investigate the feasibility of an intercontinental railway. Eleven countries are represented in this commission, which has now completed the survey. The survey was divided into the following divisions:

1st section — New York city to Laredo, Texas — 2094 miles.

2d section — Laredo through Mexico to Agulta, Guatemala — 1644 miles.

3d section — Agulta to Rio Golfito, Colombia — 1043 miles.

4th section — Rio Golfito to Buenos Ayres, Argentine Republic — 5447 miles.

Fifty-four hundred and fifty miles of this road will have to be constructed. Traversing the coffee lands of Central America, passing through the great corn-fields of Colombia, the mining regions of Ecuador and Peru, and giving quick transportation to Argentine's cattle and wheat, the road will prove a boon to South America and a source of profit to its owners. Thus the agricultural resources of South America will be developed as never before, and its soil, adapted to the growth of any crop, will be advantageously worked by this great transporting agency.

A great American has said: "This is an age of transportation. Transportation underlies material prosperity in every department of com-

merce. Without transportation, commerce would be impossible. Those states and nations are rich, powerful and enlightened whose transportation facilities are best and most extended."

We see the importance of these great railroad projects that have taken definite shape, and all will probably be completed within the present decade.

These railroads will mark the greatest triumphs of the steam railroad yet known, and will open up vast areas to the developing agencies of modern commerce.

QUESTION SUMMARY.

1. Who built the first locomotive?

2. Where and when was the first tramway built in England?

3. What is a tramway?

4. When and where was the first railway in America?

5. What was the first railway authorized to do a general transportation business?

6. Name the termini of this railroad to-day.

7. What commercial cities are connected by this railroad?

8. What can you say of the railroad as a factor in commerce?

9. Discuss weight of locomotives of modern railroads.

10. What can you say of hauling capacity or power of locomotives?

11. Upon what does the life of a locomotive depend?

12. Name the different kinds of cars used in passenger service, with some facts about each.

13. Discuss cars in the freight service.

14. What is the modern steel car, and what can you say of its use?

15. What can you say of the auditing department of a railroad system?

16. What do we mean by the auditing department?

17. Name ten trunk lines of the United States, with termini of each.

18. What cities of commercial importance do each connect?

19. Why is the N. Y. Central Railroad so important commercially?

20. Compare time in transit from New York to Buffalo in 1800 and in 1900.

21. In 1800 had any one crossed the American continent? *Ans.*, No.

22. Take train at Boston and reach Pacific coast by six different routes, naming important commercial centers passed through, railways traveled over, and the Pacific port reached.

23. Discuss the White Pass & Yukon Railroad.

24. Tell about the Cascade tunnel, on the Great Northern Railroad.

25. What incident shows the rebuilding and constructive power of railroads?

26. Where is one of the greatest railway stations in the world, and what can you say of it?

27. Name the continents in order of railway mileage.

28. The United States in 1900 had 190,000 miles of railway; what proportion was that of the world's mileage?

29. What are the ranking railway countries of South America?

30. What are the ranking railway countries of Europe?

31. What are the ranking railway countries of Asia?

32. Name five transcontinental railroads, and locate each.

33. Indicate six different railway routes from Boston to the Pacific coast.

34. Name the important commercial centers passed through, important rivers and mountains crossed, and the Pacific port reached by each route.

35. Can you name any large railway tunnels besides the Cascade tunnel? *Ans.*, St. Gothard and Simplon tunnels, in the Alps, of Europe; Hoosac tunnel, in Massachusetts; Alpine tunnel, in Colorado; and Port Huron tunnel, under Detroit river.

36. Learn the following commercial terms:

B. & A. R. R.—Boston & Albany Railroad.

Erie Route—Chicago & Erie Railroad.

M. C. R. R.—Michigan Central Railroad.

Lake Shore Route—Lake Shore & Michigan Southern Railroad.

N. Y. C. R. R.—New York Central Railroad.

B. & O.—Baltimore & Ohio Railroad.

C. & N.—Chicago & Northwestern Railroad.

C. B. & Q.—Chicago, Burlington & Quincy Railroad.

C. M. & St. P. R. R.—Chicago, Milwaukee & St. Paul Railroad.

Rock Island Route—Chicago, Rock Island & Pacific Railroad.

N. P. R. R.—Northern Pacific Railroad.

G. N. R. R.—Great Northern Railroad.

U. P. R. R.—Union Pacific Railroad.

Maple Leaf—Chicago & Great Western Railroad.

C. & A. R. R.—Chicago & Alton Railroad.

A. T. & S. F., or Santa Fe Route—Atchison, Topeka & Santa Fe Railroad.

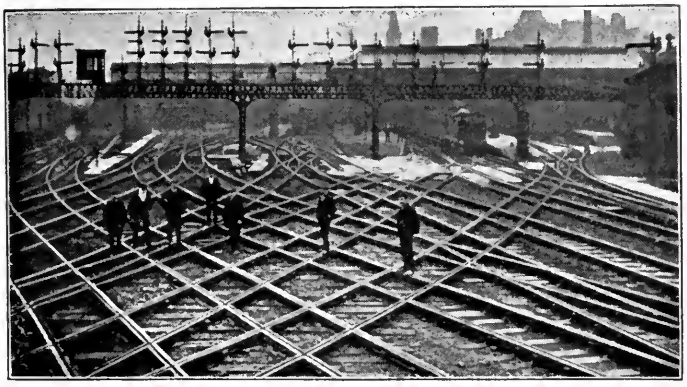
Mo. Pac. R. R.—Missouri Pacific Railroad.

I. C. Route—Illinois Central Railroad.

L. & N. Route—Louisville & Nashville Railroad.

M. & O.—Mobile & Ohio Railroad.
Queen & Crescent—Cincinnati, New Orleans & Texas Pacific Railroad.
N. & W. R. R.—Norfolk & Western Railroad.
C. & O. R. R.—Chesapeake & Ohio Railroad.
S. R.—Southern Railway.
A. C. L.—Atlantic Coast Line Railroad.
S. A. L.—Seaboard Air Line Railroad.
Plant Route—Plant System of Railways.
M. K. & T., or "Katy" Route—Missouri, Kansas & Texas Railroad.

37. What railroad now has a locomotive 70 feet long, 16 feet high, that weighs 260,000 pounds, and can haul a train carrying the harvest from 5000 acres of wheat? *Ans.*, Atchison, Topeka & Santa Fe.



Remarkable Railway Crossing at Newcastle, England—1135 Trains Daily.

CHAPTER V.

Important Aids to Commerce.

1. The Postal Service.

The fast mail of to-day is one of the great aids to domestic commerce. The modern postal system is supposed to have had its origin in Great Britain, 600 years ago.

Letters were carried at regular intervals on designated routes, the cost of transportation being paid by the one receiving the mail matter.

All the mail of that early day was carried by footmen.

When the American colonies were established, the English settlers brought their custom of mail transmission with them. Records in Massachusetts show a definite system of mail transmission and delivery in its provinces as early as 1639. Virginia, by colonial law, provided for a plantation post in 1657.

A monthly post between Boston and New York was established in 1672. Most of the coast colonies were reached by regular post before the close of the seventeenth century.

Regular post-roads and uniform rates were established by Dr. Franklin, whom the British Crown appointed Postmaster-General in 1753.

He improved the overland mail, and arranged for the ocean mail to be carried only on the swiftest sailing vessels plying between Europe and America. He aided navigators to plat new routes across the Atlantic, that should either take advantage of the winds or lessen the distance. In this way the time for a passage to the home-land was shortened several days, increasing the utility of the mail service.

One of the early acts of Congress was an act establishing a schedule for letter postage. The cost of transmission was based on the distance to be carried. To-day the transmission depends upon the weight and character of the mail transmitted.

The advent of the railway in the Eastern States introduced a new messenger for our mail service, and settlements in the West sent the "Pony Express" to those plains and mountains in the path of advancing civilization.

The organizing of postoffices and marking out post-roads in new settlements has been a duty the Postal Department has always been prompt to perform. When the gold excitement called gold-seekers to the Pacific coast, and San Francisco became a city of thousands almost immediately, the Government Postal Department was found prompt in the delivery of its Eastern mail. Across the plains and over the mountains of our Great West were established post-roads that gave a reliable mail service a generation before the telegraph and the railroad crossed the continent. The

mail carrier was a fearless, swift rider, supplied with fresh ponies at regular stations and relieved by another carrier at division points.

This "Pony Express" was established at great cost, and the carriers who served the public were frequently beset by highwaymen, chased by Indians, and fatigued or benumbed by inclement weather. These efficient messengers took pride in transmitting the mail across their divisions in as quick time as running horses could make.

The stage-coach in many places served not only to convey passengers but also the United States mails. The establishment of the railway post-office in 1864 gradually supplanted the footman, pony express, and stage-coach. To-day, scarcely a railroad can be found that is not also a post-road for the United States.

The railway mail clerks gain their position by examinations that determine their fitness for the work.

To-day there are over 8000 employés in this branch of the system, handling upwards of thirteen million pieces of mail annually. The delivery system of the department was established in 1863 for the larger commercial centers, and for the express purpose of facilitating business.

To-day the delivery system numbers 14,000 carriers, who deliver the mail at the residence or store from two to eight times a day in all commercial centers.

Another important branch is the money-order division, which Postmaster-General Smith declares to be the greatest of international clearing-houses. Through this division money can be sent to all parts of the commercial world. Over 200 million dollars is annually sent through this department, with a loss of less than fifty dollars a year by fraud. In 1874 the leading commercial nations established the Postal Union, which fixed uniform rates and conditions of transmission of mails from one country to another.

The Superintendent of Foreign Mails for the United States sends the mails only on the fastest steamers to foreign parts. A list of the designated steamers is sent to each postoffice in the nation on railway connections, each month.

In case a letter fails in delivery and the sender's name is not known, it is then sent to the Dead Letter Office, at Washington, D. C., where it is opened, returned to writer of same, or forwarded to the one whom the letter indicates that it should be sent to. This office is reported to receive 20,000 "misdirected, unaddressed or unclaimed" letters daily, and to return to senders one million dollars' worth of drafts, stamps, and commercial paper annually.

The Postal Auditing Office employs 500 clerks, and is declared to be the largest accounting office in the world. Here the quarterly reports of the nearly 80,000 postoffices of our nation are examined. The accounts now exceed 500 million dollars annually. The entire Postoffice Department through its 200,000 employés handles nearly six and one-quarter billion pieces of mail. Postmaster-General Smith declares: "The Postal establishment of the United States is the greatest business concern in the world. It handles more pieces, employs more men, spends more money, brings in more revenue, uses more agencies, reaches more homes, involves more interests, than any other human organization, public or private. The postal service of England, France and Germany includes the telegraph, and yet the postal business in this country surpasses both post and telegraph in any of these lands."

2. The Telegraph.

Probably we could scarcely name a greater aid to commerce than the telegraph, which annihilates space and is an instantaneous messenger.

The business world owes its debt of gratitude to the ability, energy and persistency of Professor S. F. B. Morse, who gave the lightning a language and business this quick errand-boy.

From early boyhood Samuel Morse was especially interested in electricity, and on entering Yale he carried on experiments in electricity in Professor Day's laboratory under the latter's direction.

Being both a sculptor and a painter, Professor Morse was given the chair of Fine Arts in the University of the City of New York, in 1835. He continued to carry on experiments in his favorite science in his laboratory.

While returning in a packet-ship from a European trip in 1832, Professor Morse invented his instrument for talking by electricity. Although in mid-ocean, it worked perfectly. In his New York laboratory he made a telegraph line one-half mile long, in 1835. Transmission and registration were perfect. Here he devised his dash alphabet, and made it practical on his laboratory line.

Professor Morse in 1837 applied to Congress for aid to build a telegraph line from Washington to Baltimore. Not receiving encouragement from this source, he converted all his property into money, and used it in perfecting his instruments and pushing his enterprise. With little or no encouragement from the business world, unable to interest Congress, reduced to such abject poverty that he sometimes had but one meal a day, this inventor, whose telegraph has been the greatest modern agent of commerce, went through a struggle that would have crushed a less persistent man.

A bill passed Congress in March, 1843, appropriating $30,000 for the purpose of "constructing a line of electric magnetic telegraph" from the capitol at Washington to Baltimore.

Professor Morse was given direction of the work, and on May 24, 1844, he told Miss Ellsworth, daughter of the Commissioner of Patents, he was ready for the message he had promised her the privilege of dictating. This first message sent over the wires was, "What hath God wrought?"

In 1847 the telegraph was introduced into Germany, and from there throughout the Eastern Continent. The delay in transmitting telegrams from one country to another, and the different scale of rates, led to the establishment of an International Bureau of Telegraphs in 1865.

This Bureau of the world's telegraphs is located at Berne, Switzerland, and has established a uniform schedule of rates, made possible more rapid transmission of international messages, and so systematized the work of the telegraph that from any telegraph office a message can be sent to any other telegraph office in the world. Prior to the formation of the Bureau the sender of an international message could not know the cost of the telegram to point of destination, and an appalling list of charges in many different kinds of money often greeted the receiver at the other end.

The Bureau has made the money unit the franc, and has codified the charges so that the sender may now know the exact cost of a telegram from one office to any other telegraph office in the business world.

The Sub-marine Cable.

In 1795 a Spaniard named Salva discussed submarine telegraphy before the Barcelona Academy of Sciences. He then presented a plan and recommended submarine connection between Barcelona and Majorca, an island off the mainland. Dr. O'Shaughnessy, director of the East India Telegraph, laid insulated wires under the Hugli river in 1839, and transmitted telegraphic signals through them. The practicability of submarine telegraphy was successfully proven by Professor Morse with his copper wire cable from Castle Garden to Governor's Island, New York harbor, in 1842. The next year he suggested that a cable be laid connecting the United States and Europe. In 1845 Ezra Cornell laid twelve miles of submarine telegraph from New York city to Fort Lee. Cotton was used as an insulator, and

the whole was inclosed in a lead pipe. The cable was destroyed by the ice a few months after it was laid, but until its destruction it worked perfectly. A company of English and French laid a cable across the English channel in 1851. This cable was twenty-five miles long, and was laid in water averaging 120 feet deep. Two years afterward, England, Ireland, Scotland and the Continent of Europe were connected by submarine telegraph. There were six cables laid, the longest one being 100 miles, and all worked successfully.

The first attempt to lay a cable across the Atlantic ocean was made by Cyrus W. Field, in 1857. It was planned to lay the cable from Newfoundland to Valentia, Ireland, a distance of 2500 miles. After laying some 250 miles of the cable from the Valentia end, the wires broke, and the work had to be abandoned. The next year a new cable was made, and successfully laid. It is reported that one message sent across the ocean on this cable saved the business world $250,000. After eighteen days the cable ceased to work.

In 1865 Mr. Field made another attempt to lay the cable. The largest vessel then known, the Great Eastern, was used in laying this cable. It started from Valentia, Ireland, carrying 2500 miles of cable. When a thousand miles at sea the cable parted, in water fully 11,000 feet deep. Although nine days were spent in searching for the lost cable, it could not be found. Undaunted and with tireless devotion to his purpose, Mr. Field organized a new company, with a capital of $3,000,000, to make a new cable. This cable consisted of seven copper wires surrounded by a number of coatings of gutta-percha and water-proof coverings. These were protected by ten Bessemer steel wires. Each of these steel wires was wound with pitch-soaked hemp. The shore ends were further protected by thirty-six iron wires wound spirally around the cable, and covered with wrappings of tarred hemp. After the new cable was completed it was stored in the Great Eastern and taken to Valentia. The steamer began paying out the cable July 13, 1866, and successfully completed its task at Newfoundland July 27th. As the United States was connected with Newfoundland by cable, our nation at once entered into telegraphic communication with Europe, which proved permanent. The Great Eastern returned to search for the parted cable of the previous year, and after eighteen days' search, grappled the cable, brought it on board, and when it was found to be in good working condition the broken end was spliced, and on September 8th the Newfoundland end was successfully landed at Trinity Bay.

The rate of speed over these cables at first was an average of eight words per minute, but was increased to fifteen words per minute.

In 1869 the French laid a cable from Brest to Nova Scotia, and the British Indian Submarine Telegraph Company completed a line from Suez to Bombay.

Although it is less than a half-century since Cyrus W. Field laid the first ocean cable, the wires have crossed every ocean save the Pacific. The total number of submarine telegraphs is given as 1500. The aggregate mileage is seven times the length of the equator, and the messages number upward of six million annually.

England has projected a cable from Victoria, British Columbia, to Sidney, Australia; while the United States contemplates the laying of a cable from San Francisco to Manila, via Honolulu, Wake Island, and Guam. These projected cables will be the longest single cables yet made.

In June, 1897, occurred Queen Victoria's Jubilee Celebration, marking the Queen's sixty years' prosperous reign. One feature of the jubilee was a great procession, in which every province of the empire was represented. Before leaving the palace, Queen Victoria sent this message to every British colony: "From my heart I thank my beloved people. May God bless them.—Victoria R. I." Before the Queen's carriage in that procession

reached London Bridge, a reply to this telegram had been received from Canada, Australia, Cape Colony, India, and more than thirty other points.

This shows the speed with which news can be carried by the telegraph. It enables the press to gather up the happenings of the day from all parts of the earth and present them at our breakfast-tables the next morning.

When President McKinley was shot in Buffalo, September 6, 1901, the shot was known around the globe before the swiftest train out of Buffalo reached New York city. The most impressive silent testimony to the greatness and goodness of a man was given on the day the late President William McKinley's body was placed in the tomb, September 14, 1901. At the hour of the funeral services at Canton, Ohio, all business of the United States by cable, telegraph, railroad and steamer lines ceased. Across the prairies, in the mountains, on the plains, were thousands of motionless trains, the vessels of our rivers and coasts moved not a wheel, while operators checked the hitherto ceaseless throb of the electric telegraph as the business world gave its five-minute tribute to the martyred President.

Every city of commercial importance has its money-order telegraph office, through which, in a few hours, an order for money can be wired to any other commercial city in the business world. Thus a traveler having money on deposit in San Francisco, who is now traveling in Russia, can "wire" his banker for $300, and the banker in San Francisco, through the telegraph, sends the Russian office an order for the money, so the traveler may have it to use the same day he calls for it. The sum advanced by the Russian telegraph office is sent from the San Francisco office by earliest steamer. The reasonable fee charged for this accommodation has made the telegraph a great medium of exchange in the financial world.

The completion of the projected American cable across the Pacific will be of great service to our nation, shortening the distance a telegram must travel from Washington to Manila by many thousand miles. The route of a telegram from Washington to Manila by the two routes is here given: Washington to New York, by land; New York to Valentia, by cable; Valentia to Brighton, England, cable and land; Brighton to Havre, by cable; Havre to Marseilles, by land; Marseilles to Alexandria, by cable; Alexandria to Suez, by land; Suez to Aden, by cable; Aden to Bombay, by cable; Bombay to Madris, by land; Madris to Singapore, by cable; Singapore to Saigon, by cable; Saigon to Hong Kong, by cable; Hong Kong to Bolinao (P. I.), by cable; Bolinao to Manila, by land. The total distance being 14,000 miles.

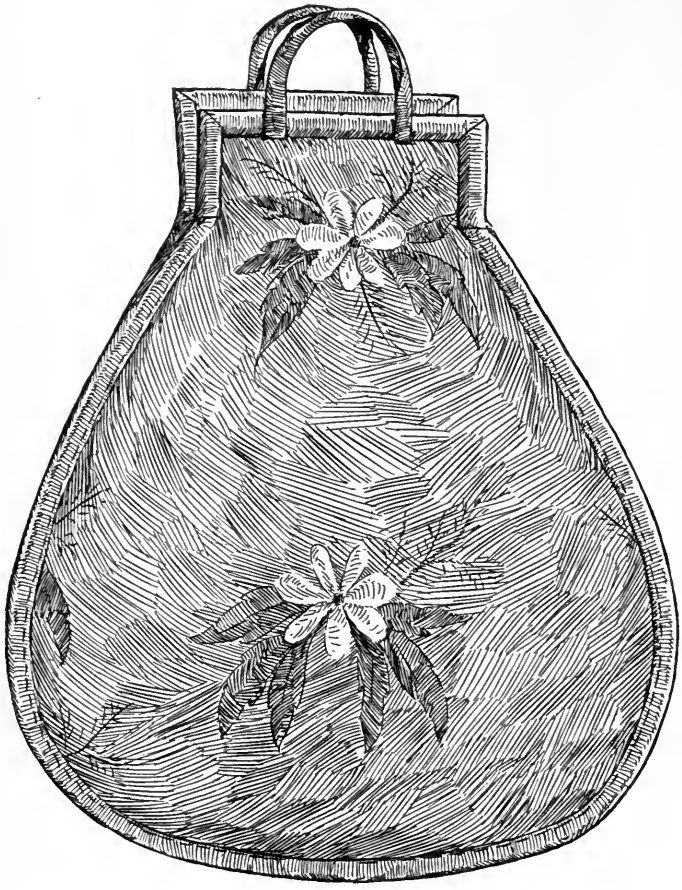
Second route: Washington to San Francisco, by land; San Francisco to Honolulu, by cable; Honolulu to Wake Island, by cable; Wake Island to Guam, by cable; Guam to Manila, by cable and land. The total distance is 9980 miles.

With a shortened water route from our eastern shores and European ports to West Asiatic and Australian ports and commercial cities united by cable across the Pacific, the number and capacity of Pacific steamers will be multiplied and its commerce will soon rival Atlantic commerce.

From a speed of three to eight words per minute the cable has been improved so that to-day the business man in America sends his message to the business man in Europe at an average speed of fifty words per minute. The rate has been so reduced that the New York merchant can talk to his London agent at 25 cents per word and instruct his Manila representative at $2.50 per word.

While A. T. Stewart waited six months for an answer to his business correspondence in East-Indian island commerce fifty years ago, John Wanamaker, in the same New York house, can to-day transact business with Bombay, Calcutta and Singapore by telegraph within six hours.

We can see, then, that the electric telegraph, land and submarine, is an indispensable agent of



"Carpet-Bag Express."

news and commerce to-day. Every hour its wires flash dispatches over the mountains and under the seas that give the press its international news, the business man the world's markets, and make all people of the earth neighbors to one another.

3. The Telephone.

The most interesting exhibit at the Centennial Exhibition was the telephone. This apparatus was the invention of Alexander Graham Bell, son of a distinguished educator of Scotland (Professor A. M. Bell). Mr. Bell's father was the author of a system of instruction called "Bell's visible speech." This system proved helpful in teaching deaf-mutes to speak as well as in overcoming impediments in speech. Alexander had thoroughly mastered his father's system, and when he was called to the chair of vocal physiology in Boston University in 1871 he began experimenting with an apparatus to aid conversation by means of an electric wire attached to a diaphragm at either end. In 1875 he perfected an instrument that successfully stood his tests and carried on conversations at Salem as well as at Boston.

To-day the telephone is an indispensable factor in the business world. A merchant in Chicago desires a conference with a dealer in St. Louis. Formerly he would be at the expense of traveling to St. Louis, where now he is saved both time and expense and given a conference with the St. Louis dealer by telephone.

The telephone business of the United States alone requires over 600,000 miles of telephone lines, which is constantly being increased. The original plan has been improved upon, until now one can talk to a friend 1500 miles away.

The telephone brings buyer and seller "ear to ear" if not "face to face."

4. The Express.

Mr. W. F. Harnden, in February, 1839, planned to make a business trip from Boston to New York. A book-dealer and some Boston merchants desired him to transact some business for them, and so, when he left Boston, March 4th, Mr. Harnden took their orders and bundles in his carpet-bag (the "grip" of those days) with his own bundles. He journeyed via the Boston & Providence Railroad and Long Island Sound steamer to New York. His safe delivery of the parcels and transaction of the New York business for his neighbors gave such satisfaction in Boston that Mr. Harnden resolved to similarly make four trips per week for his Boston friends from Boston to New York, charging a nominal sum for his

carpet-bag delivery and transaction of business in the nation's metropolis. He entered into contract with the railroad and steamer line that took him on his first trip, agreeing, for transportation of himself and his "Carpet-Bag Express," to share with them the profits of the business.

Thus originated the Express system of this country, now so indispensable to both buyers and sellers. While European countries have a "parcels post" system, similar to the baggage system of our railways, it is not the aid to commerce that the express system has proven to be. This system was Yankee in origin, and was established for the sole purpose of insuring safe and prompt delivery of parcels or merchandise of any kind.

Mr. Harnden's carpet-bag, in which the express business was born, is preserved in the Boston office of the Adams Express Company, as an historic souvenir.

The first express west of Buffalo was established by Henry Wells, in 1845. In 1849 a California express line was established by Adams & Company. Wells, Fargo & Company was established in 1852. Its lines of express now reach all the principal cities of the United States, Mexico, Canada, and British Columbia, and forward express to "London, Paris, Hamburg, and all parts of Europe, South America, China, Australia, and Japan." It now carries any valuable or merchandise, from a diamond ring to an elephant. Its 42,670 miles of service is divided as follows:

35,791 miles of railway routes.
4763 miles of ocean steamer routes.
1305 miles of stage routes.
811 miles of inland steamer routes.

Every night it sends a solid express train out of Jersey City via the Erie Route of eight to ten express cars. At Chicago the cars of express for the Pacific coast are transferred to the Santa Fe Route, and run into San Francisco four and one-half days from time of starting. Saturday night after business hours a San Francisco merchant can, by telegraph, purchase a bill of merchandise in New York city, and rely upon the express getting the merchandise to him in time for the next Saturday's trade.

The express company just described illustrates the work of the system so efficiently performed by fully a score of leading lines that have grown into a national business within the last fifty years. Every line of railroad and every steamer route has an operating express company, whose business is entirely separate from the traffic of the transportation line. The express company of to-day enters into contract with the transportation line and pays a definite per cent. of its business over the route for the exclusive privilege of doing that business. It has a place of business on every passenger train or boat on the line. Although express and baggage may be carried in the same car, the express messenger cannot take baggage, and the baggage-master will not take unchecked baggage, which must be sent by express or consigned to the freight department of the transportation line.

Most of the transcontinental express lines have adopted an interchangeable money-order system. For the same rate charged for a postal money order, an express money order can be obtained. The postal order is payable at one specified post-office, but the express order is payable at any express office. This enables a number of business men to use the same order with the cost of one exchange, since it is both negotiable and payable at almost any express office in the nation.

The express has been a useful factor in increasing the vegetable and fruit business of the country. As early vegetables and fruit for market are sent largely by express, the express companies have almost universally adopted the "consignment plan." Any producer along the line who has fruit or vegetables and fails himself to find a buyer, can consign the merchandise to the express agent at any point on the line.

This agent will place the fruit or vegetables

sent him upon the market as soon as received, collect from sales, and send the cash returns to the producer. The express companies now sell millions of dollars' worth of perishable merchandise annually for their customers by the "consignment" plan.

Another accommodating feature of the express business is the "collecting system." If a person desires rent, an overdue bill or note, or any money obligation, settled in any town containing an express office, he can collect it through the express agent. The person desiring the collection gives the express agent in his city an order for the collection. This order is telegraphed to the city named in the order. The express office at that point sends its agent to make a personal demand for the money, showing the telegraphed instructions for the same. If the money is collected it is sent by earliest express, and the party ordering the collection pays expressage on the money and a per cent. for collection. If payment is refused, the party ordering the collection is notified by the express agent in his city, and is simply asked to pay the cost of the telegrams.

A large business for the express has grown up under the "Collection on Delivery" (C. O. D.) plan. A shipper selling goods to a stranger, or buyers desiring to examine goods sent on approval, use the C. O. D. system of express. The shipper marks the amount to be collected, and while the buyer has the right to examine the merchandise, the amount named by the shipper must be paid before the goods can be taken. The express company expresses the collections to the shipper. The express messenger supplements telephone, telegraph and transportation line, rendering the service of each more effective in the world of commerce, while he with "speed, security, and economy," like Mr. Harnden, does business for his neighbors. His business during the last five years in the United States alone has given him three-quarters of a billion-dollar bank check each year.

The following express companies are listed in the official Railway Guide of the United States, Canada, Mexico, and Cuba:

Name.	*Commercial Abbreviation.*
Adams	Ad.
American	Am.
Canadian	Can.
Denver & Rio Grande	D. & R. G.
Dominion	Dom.
Great Northern	G. N.
Hidalgo	Hid.
Inter-Oceanic	Int.
Long Island	L. I.
Maritime	Mar.
Merchants	Mer.
Mexican National	Mex. Nat.
National	Nat.
New York and Boston Dispatch	N. Y. & B. D.
Northern Pacific	N. P.
Pacific	Pac.
Southern	Sth.
United States	U. S.
Wells, Fargo & Company	W. F.
West Jersey	W. J.
Western	West.

More than 200 short-line or "local" companies share with the above-named companies the great express business of our domestic commerce.

QUESTION SUMMARY.

1. Where did the postal system originate? How many centuries ago?

2. Explain the origin of the American colonial post system.

3. When was the New York and Boston post established?

4. How often was mail carried on this route?

5. What can you say of mail transmission between Boston and New York to-day?

6. Who established regular post-roads and made uniform postal rates in the colonies?

7. What means did he adopt to quicken ocean mails?

8. What determined the cost of mail transmission then?

9. Upon what does it now depend?

10. Describe the "Pony Express."

11. How did the stage-coach become a factor in mail transmission?

12. Explain the free-delivery system.

13. When was this system established?

14. How many persons are now employed in the free-delivery division of the Postoffice Department of our nation?

15. Explain the postoffice money-order system.

16. What shows the value of this service?

17. What is a clearing-house? *Ans.*, A clearing-house is a bank of banks. A place where representatives of all the banks of a commercial center meet daily and "clear" their bank's account with every other bank in the association or clearing-house.

18. When was the Postal Union established, and what are its advantages to commerce?

19. How does our Superintendent of Foreign Mails quicken foreign mail transmission?

20. Explain the work of the "Dead Letter" Office.

21. Describe the work of the Auditing Department of the postoffice.

22. Why is the Postal Department considered an important factor of commerce?

23. Compare our postal service with England, France, and Germany.

24. Who was Prof. S. F. B. Morse, and what did he do for commerce?

25. Why did he not bring out his invention before 1844?

26. What was the first message? By whom dictated?

27. Between what two cities was the first telegraph line established?

28. When was the telegraph introduced into Europe?

29. Name the continents in the order of their telegraph lines. *Ans.*, North America, Europe, Asia, South America, Africa, Australia.

30. When was a bureau of the world's telegraphs established?

31. Where are the headquarters of this bureau?

32. Why located there? *Ans.*, Nearest the center of commerce.

33. Discuss the work of this bureau.

34. Who first discussed submarine telegraphy? When and where?

35. Who proved the practicability of submarine telegraphy? How?

36. Discuss the work of Ezra Cornell.

37. What cables were laid in 1851 and 1853?

38. Who attempted to lay an ocean cable in 1857?

39. Why did he not succeed?

40. Between what points did Mr. Field seek to lay the cable?

41. What was the result of his second attempt?

42. Describe Mr. Field's third attempt to lay a cable.

43. When was permanent telegraphic communication established between Europe and America?

44. Describe the construction of this cable of 1866.

45. What was the rate of speed over the cable when first laid? What is the present rate of speed?

46. What incident shows the rapidity of telegraphic news?

47. When and to whom did the telegraph, steamboat and railway service give a five-minute tribute? Describe the incident.

48. Explain the system of sending money by telegraph.

49. Trace a cablegram from Washington to Manila by the present route. What is the total distance?

50. Trace a telegram from Washington to Manila by the projected route. What is the total distance?

51. Show by illustration the value of the telegraph to a United States merchant doing foreign business.

52. What was the origin of the telephone?

53. Where and when was the first telephone line?

54. Illustrate the value of the telephone to the business man.

55. Describe the "Carpet-Bag Express."

56. When was the first express line across the American continent established?

57. How was express transported on this line at first? *Ans.*, By rail to the Mississippi river and by pony express and the stage-coach from there to the Pacific coast.

58. What is meant by an express train? Illustrate.

59. Explain the interchangeable express money-order system.

60. What is the "consignment" plan of the express system?

61. Illustrate the "collecting" system of the express; established for what purpose?

62. What is meant by C. O. D.?

63. What articles can be sent by telegraph?

64. Why is the express described as "Yankee" in both origin and growth?

65. What do you say is the value of the express to commerce?

66. Name ten important express companies. Locate line of operation.

67. Enumerate the aids to commerce, given in this chapter, as you think they rank in value. Give reasons for your answer.

68. What express company commemorated its fiftieth anniversary by giving every person in its employ a silver medal, February, 1902? *Ans.*, Wells, Fargo & Co.

69. What foreign cities are connected with our nation's express business? *Ans.*, Those ports having steamer connection with our nation's commercial cities.

70. What is the approximate amount of our nation's express business per annum?

CHAPTER VI.

Building a Modern Steamer.

The preceding chapters have told us how steam has facilitated rapid transit on land, and we now will learn how it has also made it possible for stately palaces to cross limitless wastes of water with speed and ease that seem almost incredible.

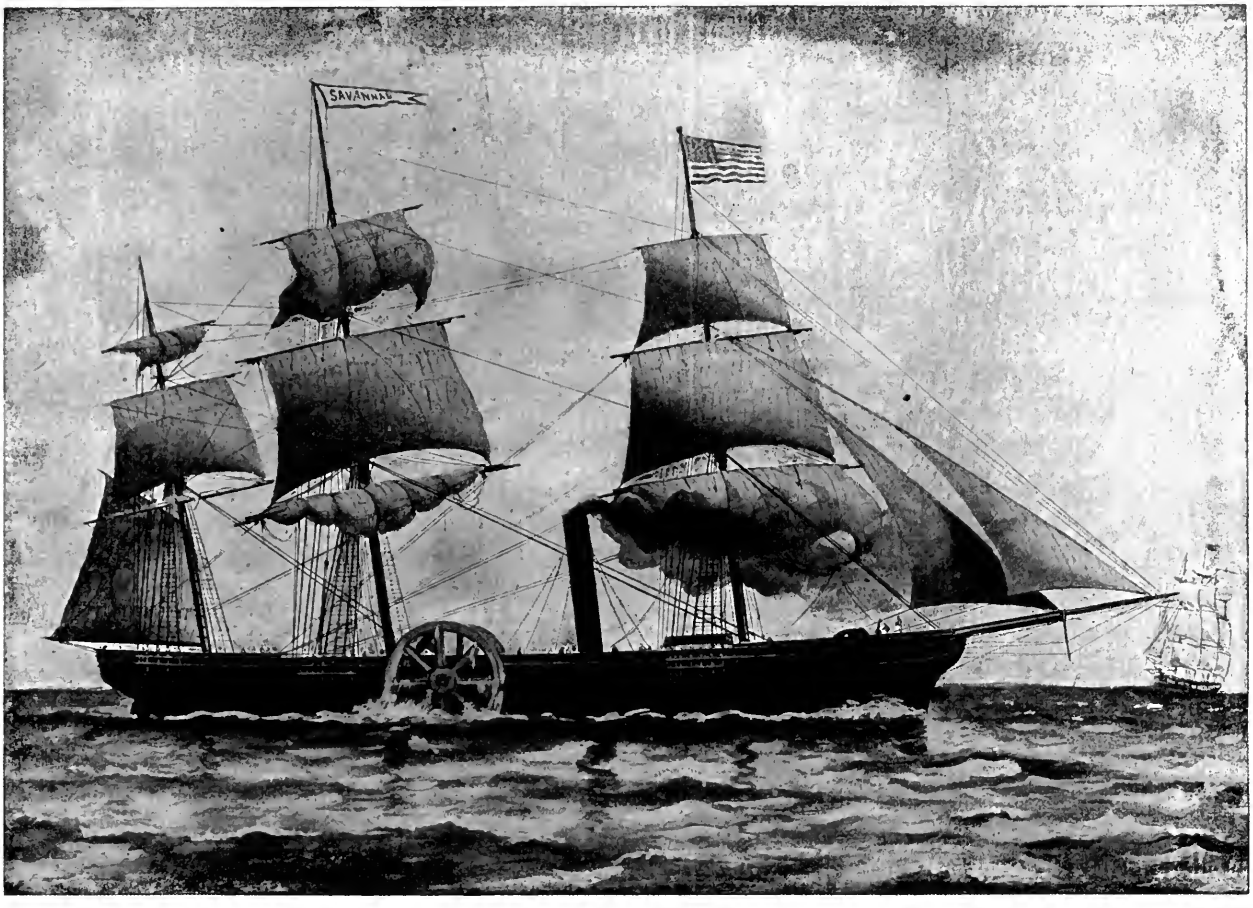
Toward the close of the eighteenth century, demand for quicker water travel began to be expressed, and when James Watt proved that steam could be used as a motive power, a number of men began to experiment with steam as a means of propelling boats. Samuel Morey built a steamboat on the Connecticut river; James Rumsey built one for the Potomac; John Fitch, one for the Delaware; William Longstreet, one for the Savannah river; John Stevens, one for the Hudson; and Oliver Evans experimented at Philadelphia. One tried to make a steam engine ply the oars; another pumped water in at the bow and out at the stern, with steam power; another had a wheel at the stern; and still another had a wheel on each side. Each one worked independently of the other, and succeeded in running his boat against the current of the river; and so each one claimed to have invented a steamboat. These men were without money; wealthy men could not be interested in such follies, and the public cared nothing for such "silly inventions." These were all made and forgotten before the nineteenth century was ushered in.

Just as James Watt was beginning his study of the steam engine, a Yankee boy was born in the town of Little Britain, Pennsylvania, who, later, revolutionized the river, lake, and ocean carrying trade, increasing cargo and lessening time of transportation. He painted portraits and landscapes with ease and rare skill, and at twenty-two West took him to London. Here he heard of Watt's work, and turned his attention wholly to mechanics. He found patrons in the Duke of Bridgewater and Earl of Stanhope, and was encouraged to perfect several useful inventions. In 1795 he was a civil engineer. In 1796 he visited Paris on invitation of the United States minister. Here, in 1803, he perfected and successfully launched a small steamboat on the Seine. Not satisfied with the way the French received the steamboat, Robert Fulton returned to the United States in 1806, and perfected and launched on the Hudson his "Clermont." This boat was a side-paddle steamboat, 130 feet long, with wheels 15 feet in diameter and 4 feet wide. The trial trip was made August 7th, 1807, from New York to Albany. The sailing vessels made the trip in four days, a distance of 150 miles. Fulton made the trip with the Clermont in 32 hours. Thus Fulton, while not the first to apply steam to navigation, was the first to make a successful and practical demonstration of the problem, and this first long steamboat trip turned indifference to enthusiasm and capital was invested in steamboats. Thus a new and permanent element of water transportation sprang into being.

A river steamer was launched at Pittsburg in 1811, and sent down the Ohio and Mississippi rivers to New Orleans. A lake steamer to run from Buffalo to Detroit was launched in 1814.

The first steamer to cross the ocean was the Savannah, in 1819. This steamer crossed the ocean in twenty-five days, using pitch-pine for fuel. Although it advertised for passengers, no one applied for transportation.

Finally, anthracite coal was found, improvements in machinery were made, space for freight was increased, and the time of crossing the Atlantic lessened. In 1840 a company was organized to furnish a freight and passenger line of steamers between America and Europe. This was the Cunard line, the pioneer steamer line of the ocean. Thus dawned the day of steam navigation, when Neptune is overcome, Eolus is baffled, and

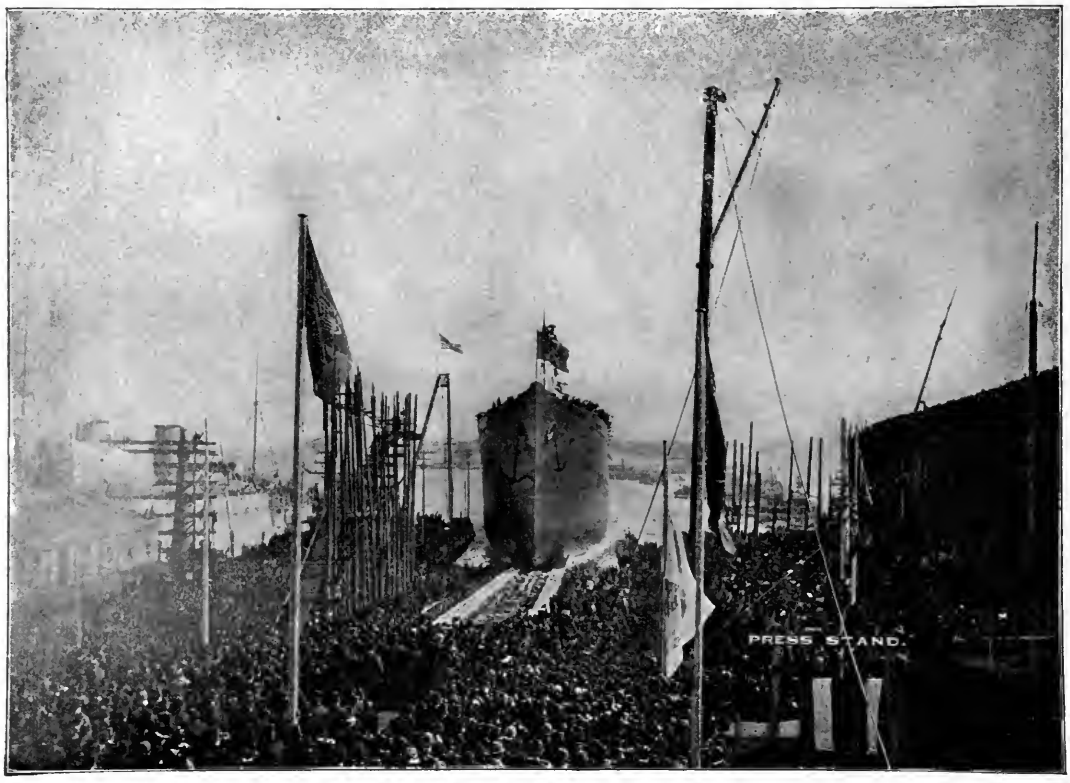


The Steamship "Savannah."

the deep made the pathway and medium of transit for a mighty and ever-increasing commerce.

The description of an ocean steamer may prove helpful here, as the vast majority of the American school children live inland. We will describe one of the American liners, which was christened "St. Louis," by Mrs. Cleveland, as it glided down the soaped ways in William Cramps's shipyard, in 1894.

This vessel was used by our Government as an auxiliary cruiser in the war with Spain, 1898, and therefore its description will be of special interest. When a ship is to be constructed, very careful construction drawings are made, showing ground plan, elevation, and lateral view of same — three carefully prepared drawings — indicating dimensions of every piece to be used in construction. This set of construction drawings, if approved, is now taken to the mold-loft of the shipyard, and on an immense floor-blackboard is drawn, at full size, every plate, rib and girder just as it is to be, and its relative position accurately shown. This must be carefully checked up and verified, which process is called "fairing the ship." The next step is to make the "scrive-board," a carefully prepared, full-sized chart of the ship, stamped or grooved into the wood, forming the pattern for every one of the infinite number of pieces used in the building of the ship. With the scrive-board before them, the ship's mechanics can



Launching of the Steamship "St. Louis."

now begin the construction work. First, long pliable bars of steel issue at *white* heat from furnaces. The mechanics with pincers and tongs seize these bars, and, guided by the lines on the scrive-board, fashion the ribs. To get the proper curve, the skilled mechanics do their work on a great metal floor, with countless thousands of perforations. Pegs, or, as the seamen call them, "dogs," are inserted in these holes, and assist in bending the bars so that, by proper hammering, the exact shape may be obtained. Thus with great care and labor the infinite number of ribs, rib-bands and cross-plates, after months of continuous work, are fashioned into the ship's skeleton. Then this skeleton is covered with the steel plates, cut, curved, smoothed, grooved and trimmed to such a nicety that they can be fitted with exactness. When riveted in place, decks and bulkheads are built, and the vessel is ready for its third epoch — launching.

Six thousand tons of the best American steel was utilized in fashioning the great hull of the St. Louis. The launching you have all read about, and fully understand with what pride the ship-builder rides down the soaped ways and sees his creation take its first great plunge, to float off triumphantly.

But our ship is not complete. Over 400 workmen — painters, plumbers, cabinetmakers, upholsterers, electricians, and decorators — work energetically for nearly a year after the launching. Boiler- and engine-makers are also at work, and when all is ready the ship's engines and boilers are lifted into the hull and put in place. This ship, the St. Louis, is given ten boilers, with more than thirteen miles of tubing, and two mighty engines,

Library, Steamship "St. Louis."

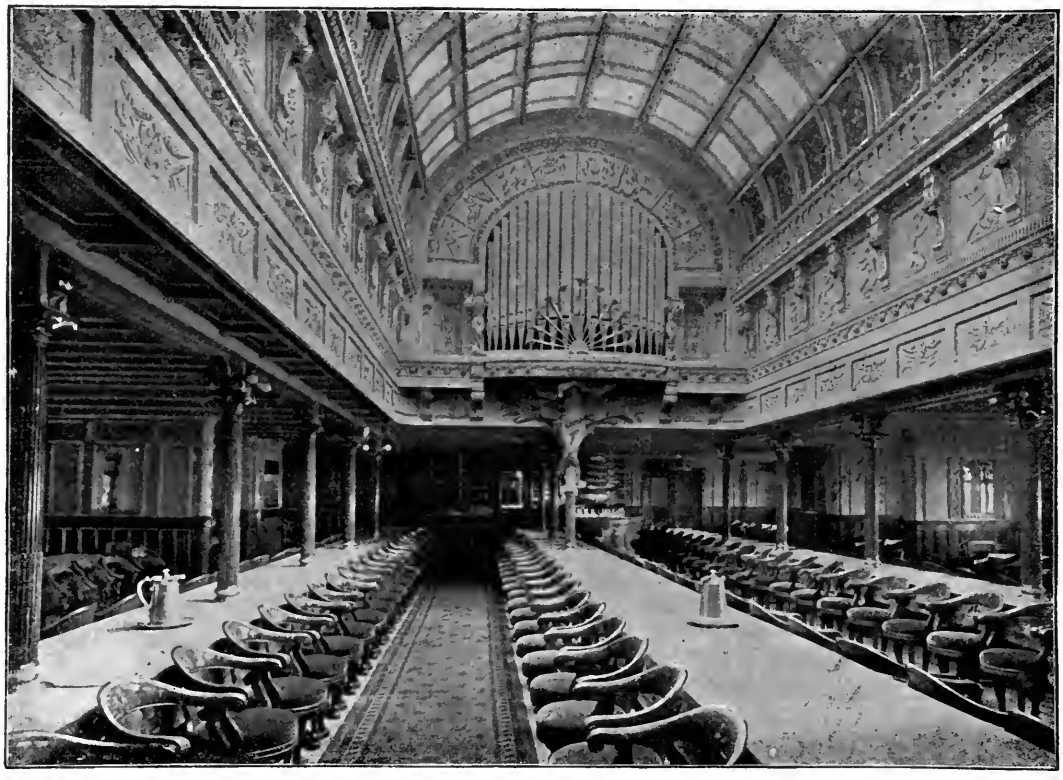
each working six cylinders at a pressure of 200 pounds per square inch, giving an energy equivalent to the strength of 20,000 horses or 117,000 Goliaths. Besides these giants, fifty or more lesser engines are used for ventilating, refrigerating, hoisting, lighting, pumping, and other purposes that assist in operating the vessel.

To the rear of the engines are placed immense steel trusses, fixed in a solid structure of cast steel weighing twenty-six tons. These support the great twin screws that are to propel the vessel.

Now let us stand on the upper deck and see if we can comprehend the magnitude of the steamer. The finest cathedral in England is St. Paul's, London, and it is no doubt the largest one in the kingdom. If our vessel be placed in a vertical position upon its stern, and we remain at the bow, we shall be 189 feet above the cathedral's great dome. If placed by Victoria Tower, House of Parliament, the bow would be 214 feet higher in the air than the tower's topmost point. Placed by the side of our own Washington's monument, we could place our hands on top of the aluminum cap, as the bow would lack but one foot of being as high as the top of this, the highest monument on the American continent.

Now let us resume the horizontal plane again, as these extreme heights make one dizzy, unless he is a sailor or a skyscraper-builder. We will go to St. Patrick's Cathedral, New York, the largest cathedral in our nation, the pride of all Americans who appreciate architectural beauty and admire noble proportions, and we find that although this cathedral would reach almost entirely across a city block or square, yet the St. Louis would extend 248 feet beyond this length.

We look down from the deck on which we stand, and we see that the water is forty feet below us.



First-Cabin Dining-Room, Steamship "St. Louis."

The vessel has five decks; that is, it is five stories high, making it much higher than most school-houses in our nation. As we walk down the promenade deck we pass by the enormous smoke-stacks, each as large as a railway tunnel. Going to the stern we see the rudder, the area of one side of which is more than 250 square feet. With such a helm worked by steam, a comparatively quick turn is easily accomplished.

On the hurricane deck a powerful search-light is placed; and in and out over the vessel are placed more incandescent lights than are used in a well-lighted city of 8000 people.

But we have not time to go over the steamer in detail, although as we pass by the first-cabin library, with its luxurious furnishings, easy-chairs, and handsome book-cases containing 1000 volumes of the world's best literature, we pause to admire its equipment.

We now pass through the grand dining-room or saloon, the pride of the ship, and the product of America's best decorative art, furnished in white mahogany with decorative panelings of various designs in bas-relief. We observe the pipe-organ in the farther end of the saloon, equal in tone and finish to a metropolitan church-organ. This is usually operated by some member of the ship's crew, and is a pleasant feature in the day's program and the Sabbath services. The saloon is so ample that 350 guests may eat at once. The second cabin, on next deck below, has a saloon almost as nice, and very comfortably furnished.

As we turn to leave the first-cabin deck, we see the grand stairway, and descending by it, we consider it the climax of architectural beauty and design.

We now descend to the hold, where the bulk of the ship's cargo is stored. The St. Louis has a

Grand Staircase, Steamship "St. Louis."

gross tonnage of 5900 tons. This means that the steamer can carry 5900 tons cargo. To give you a conception of the capacity of the hold, I will say that if the freight drawn by a freight train described in a preceding chapter were placed in the hold, we would have only just *begun to load* the steamer.

I must here speak of the professional dock-men, stevedores as they are called, who load and unload the cargo. The St. Louis may come into port at noon to-day; her immense cargo will be unloaded, her coal-bunkers filled (2500 to 3000 tons of coal), and her new cargo will be stored away ready for her outward trip by noon to-morrow.

We now walk the gang-plank to the dock, and as we gaze with pride and pleasure upon this beautiful evolution that Yankee ingenuity has evolved from "Fulton's folly," we realize the possibilities of American genius and can gain a conception of the great problems of transit and transportation that the nineteenth century genius has solved, and the mighty forces that the new century's genius seeks to control and compel to do man's bidding, doubling his commerce and trebling his profit.

QUESTION SUMMARY.

1. Who invented the steam engine?
2. What men sought to propel boats by steam, and with what success?
3. What circumstances aided Fulton?
4. Describe his experiment with the Clermont on the Hudson river in 1807.
5. When did a steamer first pass from Pittsburg to New Orleans?
6. When did the first steamer cross the lakes from Buffalo to Detroit?
7. What can you say of the Savannah and its first ocean voyage?

8. Name the first line of steamers established across the Atlantic.

9. What is the first step taken in building a steamer?

10. What must these drawings show?

11. What is the process that is named "fairing the ship"?

12. What is the "scrive-board"?

13. Describe the process of making the ship's hull.

14. When is a vessel ready for the launching?

15. How many tons of steel in the hull of the St. Louis?

16. What is added to the vessell after it is launched?

17. Show the relative length of the St. Louis; the relative height.

18. Describe some of the furnishings of the modern steamer.

19. Tell something of the capacity of the hold of a modern steamer.

20. Tell the work of the stevedores.

CHAPTER VII.

An Ocean Voyage in the St. Louis.

We watched the building of an American steamer in the last chapter, and now we will take a trip in the completed steamer.

The scheduled route for the St. Louis is from New York to Southampton, England.

All steamers carry freight. It serves as ballast, occupies space that could not otherwise be utilized, and even with passenger steamers, like the St. Louis, is a source of considerable revenue. In the fall, American apples, peaches, pears, etc., are shipped in cold storage, and find a ready sale in the English markets — especially the California fruits. To meet this European demand for California fruit our transcontinental lines of railway run special refrigerator trains twice each week from the Pacific coast during the season of fruit transportation.

American beef is also taken over at every voyage (in cold storage), large shipments being sent from the Chicago beef companies.

All meat exports must be stamped with the Government inspector's stamp before shipment. Breadstuffs are also carried, with a miscellaneous list of other commodities; but fruits, meats and breadstuffs constitute the bulk of the ship's commercial cargo from this port.

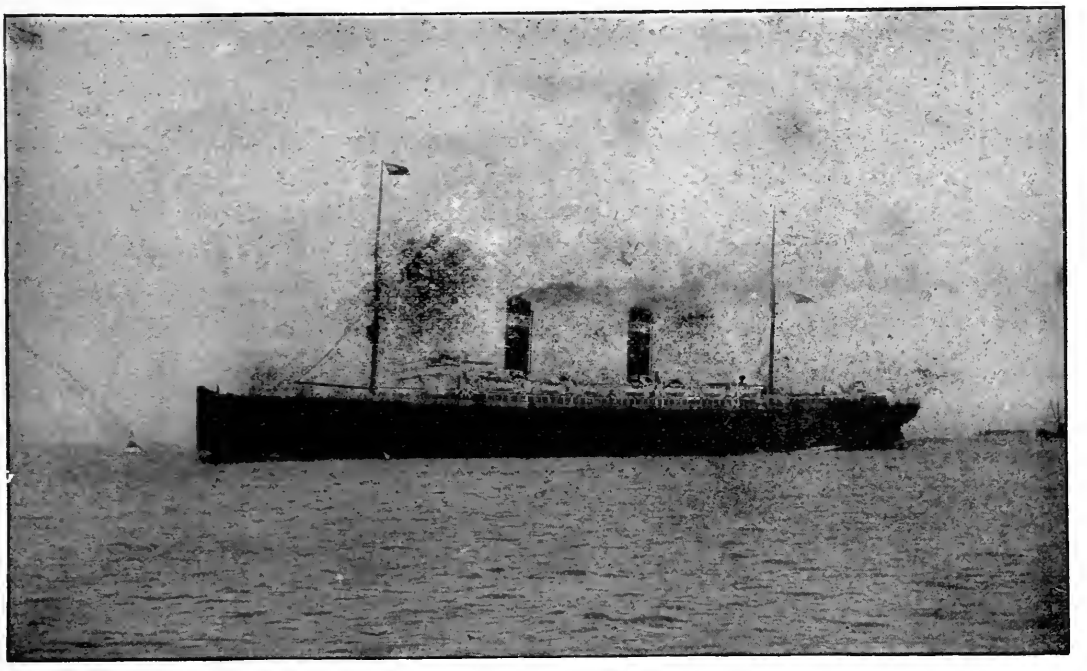
While the stevedores are storing away the cargo and filling the coal-bunkers, let us stand back from the pier and see the ship receive her passengers for the contemplated voyage.

For the winter season of the year there are generally 150 first-class, 100 second class, and from 400 to 500 steerage passengers. The average number of passengers for the summer season is 350 first-cabin, 200 second-cabin, and 700 to 800 steerage. It is to be observed that first-class passengers have state-rooms on upper deck, second-class on second or middle deck, and steerage in the hold or on the first floor.

The cost of the voyage varies with location of state-room as well as the season of the year. In winter, the rate from New York to Southampton is approximately: first-class passengers, $60 and upward each way, less ten per cent. on return voyage; second-class, $37 each way, less five per cent., return voyage; steerage, about $27 the year around. In summer, first-cabin rates are $100 and upward each way, less the usual ten per cent. on the return trip; second-cabin, $45 and upward, less five per cent., return trip.

Ten minutes before the departure, the ship's mail arrives; the bugle-call announces to all visitors that the time for leave-takings is at hand.

Promptly at 10 A. M. Wednesday morning the officer of the deck calls "cast off," the deep-toned whistle gives the signal for ropes to drop from pier No. 14, the gang-planks are hoisted, the St. Louis is swung around bow to, and starts down the bay from the North-river pier. (The Hudson is called locally "North river.") Quietly our steamer passes the lower end of Manhattan Island on the left, where is situated Castle Garden, made famous by Jennie Lind, Patti and Nilsson years ago, and where thousands of immigrants have



Steamship St. Louis.

"entered" this country. A great aquarium is now located at this place.

Near Castle Garden, at the extreme end of Manhattan Island, is the Battery with its fine park and sea-wall promenade. Now we pass Castle William, a circular battlement on Governor's Island; see Bedloe's Island, whose Liberty light illumines the upper bay at night.

The bay pilot now carefully directs the steamer through the shipping of the harbor down the Narrows, with Tompkins Light and Fort Wadsworth (Staten Island) at the right and the grim guns of Fort Hamilton on the left.

Now we enter the widening channel of the lower bay; see sharply to our left the Coney Light, and far to the north the Sandy Hook Light, toward which our steamer seems pointing.

Soon we see ship after ship at anchorage, and, wondering what this means, ask one of the crew, who informs us that we are at Quarantine anchorage. Just as we round the Romer Shoal Light our vessel turns in a graceful curve to the east, the pilot tug receives the harbor pilot, whistles a parting salute, and our steamer stands squarely out to sea. The time from the dock to Sandy Hook was 100 minutes.

The waves now come with a long, rolling swell, and break away from the bow in a myriad of wavelets.

Great canopies of smoke roll out of the immense smokestacks, and as we watch it curling and rolling far astern we observe that the ship's log has been heaved. You ask, What is the log? Our answer is, that it is a careful measure of the ship's distance and speed. Attached to an intricate indicator with a dial-plate is a strong quarter-inch rope one thousand feet long, which is attached to the stern end of the vessel between the screw and the rudder. This dial-plate registers for the ship in the same way a speed-indicator registers the bicycle's speed. Being so long, the log trails far behind the vessel, beyond the reach of the action of

the twin screws, which churn the water into a great seething mass of white and sparkling spray, leaving "soapsuds" far to the ship's rear.

But look! Down the horizon to the west sink the receding shores of the homeland, while to the north, east and south stretches the limitless expanse of rollicking green-tinted waves. Just now the ship's orchestra strikes a patriotic air, that is caught up by scores of voices. That music on the water! Surely, "America" was never more feelingly sung nor seemed more soul-inspiring.

Look down at the water, and see how rapidly it is seeking the rear. Captain Randall, who is on deck, tells us that we are now traveling at the rate of 25 miles an hour. We are in the lower route, which is known as the "Southern route," and is followed from January 15th to August 23d. The distance from Sandy Hook to the Needles (off Southampton) is 3184 geographical miles, or "knots" as the sailor calls them. The upper or "Northern route" is used from August 24th to January 14th, and is the shorter one, being 3075 knots from Sandy Hook to Needles.

The icebergs, which float down from the north during the late winter and early spring and summer, have caused all steamer lines to establish the routes as above named. All lines have agreed upon a certain course for east-bound and another course for west-bound steamers, so that the danger from collision is greatly reduced. Thus these stately palaces of the sea travel in as definite and regular roads through the ocean as the vehicles of land transit have marked and laid out for them.

Hearing the ship's bells, we seek the mate to explain to us the "watches" on shipboard. This is the explanation that we received: The day is divided into seven parts, and each watch is four hours long, save from 4 P. M. to 8 P. M. This is divided into two watches of two hours each, called the first and second dog-watch respectively. The relays of men are known as port and starboard watch respectively, from location of quarters on shipboard.

The appetizing odors from the ship's kitchen lead us now to study the scheduled program of meals for a steamer. Breakfast is at 8 A. M., lunch on deck (to an inlander a well-ordered dinner) 11 A. M., dinner 1 P.M., tea 5 P. M., and supper at 9 P. M. The feast of the day is dinner, and each one served would outwit Delmonico to surpass.

At each dinner, twenty bushels of potatoes, one thousand pounds of meat, one hundred and fifty loaves of bread and seventy pounds of coffee are consumed, to say nothing of the pastry and other delectables at dinner.

The chief engineer, on learning that we desire to visit the hold and see the furnaces, sends a guide, who pilots us down the hatchway and into the "infernal" region of the ship. The heat is intense, and we see the firemen and "trimmers" bared to the waist, with perspiration coursing down their backs, energetically striving to satisfy the red throats of the sixty-four furnaces with coal and regulate the energy thus imparted. The chief engineer informs us that the average daily consumption of coal is 330 tons, requiring the employment of 114 firemen and trimmers. This coal develops an energy equal to the combined strength of 20,000 horses, and sends this "floating city" through the water at an average speed, in fair weather, of 25 miles per hour.

We now follow our guide past the coal-bins, that, though being fast emptied, show tons upon tons remaining of the 2600 tons taken on at New York. When we reach deck again we become interested in the ship's log-book.

At the companion-way to each dining-room we observe a neat chart of the ship's course, the map being divided by cross-lines into little squares. From New York to Southampton is a map line showing the ship's course, and each day at 10 A. M. the distance of the previous day's voyage is indi-

cated by a dot (.) on the "course line" of the map, and the distance from the last dot indicates so many knots. In this way each passenger is able to follow the vessel in its course, and also knows its daily speed. So accurately is the "course line" on the map followed by the pilot that a variation to exceed two or three miles is rarely known in the long voyage of over 3000 miles. The pilot's place of business is on the upper or hurricane deck, just behind the captain's bridge. The pilot is a mariner of rare skill and intelligence, and has two very unique guides to aid him in his responsible work. The one is the ship's chronometer, a very accurate time-measure, which swings on a pivot, face up. It is placed in a close protecting-case, and is quite indispensable and exceedingly valuable. The other guide is a mariner's compass, which is a careful indicator of direction. It is about eight inches in diameter, and so carefully adjusted that the ship's motion cannot affect the unerring needle. A second compass is placed on the after deck, where the signal-flags are also found.

The latitude and longitude of the ship are taken at noon meridian, and at such other regular periods as the captain may deem advisable. This, with the distance indicated by the speed-indicator of the log at the stern, gives the data for the log-book.

Here is an abstract from the best voyage the St. Louis log records, and it shows how the log-book is kept:

Date, 1896.	*Distance, Knots.*	*Latitude.*	*Longitude.*	*Remarks.*
Aug. 1	510	.....	.....	Left Southampton 12:12 P. M.;* passed Needles 2:02 P. M.
Aug. 2	477	50.31	13.38	Light S. W. winds; hazy; sea smooth.
Aug. 3	519	50.30	27.05	Light variable winds; sea smooth.
Aug. 4	530	48.50	40.28	Moderate winds; light sea.
Aug. 5	520	45.18	52.05	S. W. breeze; light fogs.
Aug. 6	499	.....	.....	To Sandy Hook. Lightship passed at 11:26 A. M.; passengers landed 1:56 P. M. Friday.
Total..	3055	.....	.....	Passage 6 days, 2 hours, 24 minutes; average speed per hour, 20.867 knots.

*Greenwich mean time.

While copying this we hear a stir, and as we hurry deckward we learn that a streak of smoke has been sighted far to the east; later the funnel-tops appear above the water, and finally a great steamer rises out of the sea. We level our glasses, seek in vain for some identity, and have about concluded it to be a "tramp ship" (a ship that belongs to no regular line and makes no scheduled points *regularly*), when the officer of the deck informs us it is a North German Lloyd Liner. He then tells us that a regular liner is told at sea by the color of her funnels and the line flag. We find that our black funnels with a clear white band, and our white flag with a blue spread-eagle in the center, reveal our identity at sea, for these are the marks of the American line, and are found on all its New York to Southampton vessels. The American line New York to Continental ports bears the same funnel-marks, but carries a white swallowtail flag with a red star in the center; hence it is known as the Red Star line. The stranger has a cream-colored funnel, and flies a white flag with a blue key-and-anchor crossed in the center of a laurel wreath. Our signal flags are out, and questions asked: "Name? Where from and whither bound?" The answer is signalled back: "Kaiser Wilhelm der Grosse. Bremen to New York." It is one of the swiftest of the transatlantic fleet, and her majestic sweep across the ship's horizon was the event of that day.

The Saturday evening entertainment was *the* feature of the voyage. This consisted of a mixed program, arranged by the ship's passengers and crew. After the program was made up, it was printed on the ship's press, and souvenir copies sold to passengers. The music was excellent, as good musicians are found on nearly every voyage. During the interval between the first and second parts of the program, a collection was taken, which amounted to several hundred dollars. On Staten Island is a Sailors' Home, and at Southampton is

a Sailors' Orphans' Home. To the support of these go all the proceeds of the mid-ocean entertainments. Often $600 or $700 is netted, and sent to these homes at either end of the steamer route.

The passengers are called to the Sabbath morning service by the ship's bell. This service is held in the first-cabin dining-room, to which the second-cabin passengers are invited. The Episcopal service is read on the St. Louis, sometimes by the captain and sometimes by the ship's surgeon. The music is a special feature of the morning service, one of the stewards being a master player on the pipe-organ. Frequently a special evening service will be held in the second cabin by some traveling clergyman.

The crew are governed by the bells that are rung every half-hour to indicate to them the time. One bell is added each half-hour of the watch, so that the last half-hour of the four-hour watch would be indicated by eight bells, the last half-hour of each dog-watch is indicated by four bells, as they are two hours long,— first dog-watch, 4 to 6 P. M.; second, 6 to 8 P. M.

The first land sighted proves to be the Scilly Islands, just off Land's End, England. Just as we are filled with rejoicing at once more seeing the welcome land, the islands are passed, and land is again lost to view until the great Lizard's Head juts above the horizon, far to the northwest.

We now enter the most dangerous part of the English Channel, the vicinity of the Eddystone Reef, and our pilot steers to the north to avoid the dangerous rocks. Here are three principal ridges of rocks, about ten miles south of Plymouth Sound entrance, that are covered at high tide. Upon the middle ridge stands the Eddystone lighthouse, built of Portland stone incased in granite, whose foundation is dovetailed into the rocks of the reef. The present lighthouse is the third one built on this site, and though its light is sixty-eight feet above the base, the sea frequently rises so high that it breaks the strong plate-glass that protects the sixteen argand burners of the lantern.

We now round the Bolt Head, leave the Bill of Portland far to the north, and make our first stop at the Needles, the Sandy Hook of Southampton, from which time is reckoned.

We have been six days, twenty-three hours and sixteen minutes crossing the ocean.

The channel pilot climbs on board and directs our steamer up the Solent, that separates the Isle of Wight from England, into the harbor of Southampton. This has all the benefits of a land-locked harbor, owing to the proximity of the Isle of Wight, giving it the advantages of a double tide, or four tides in the twenty-four hours of the day.

The city proper is on a peninsula formed by the estuary of the river Itchen and the large estuary of the river Test. The city numbers about 75,000 inhabitants, and is an important commercial port of England.

Our pilot now turns our steamer up the Itchen to the Empress dock, the entrance to which is 175 feet wide. Here we find a frontage of 1900 feet. It is the only dock in Great Britain where deep-water loading and discharging berths can be reached by the largest vessels at any time of the day or night, irrespective of the tide.

At this port are located six very large docks, paved with granite, covering an area of 250 acres, lined with good warehouses, with hydraulic cranes and capstans throughout the system. All the docks and their approaches are brilliantly lighted by electricity. Thus we find that Southampton has one of the finest harbors in Europe, where steamers can enter and leave at any state of the tide, and all steamers are able to go direct to the piers.

Standing on the pier, we observe that while one side is being relieved of her cargo and the passengers are going off, the steamer is receiving her return cargo and coaling from the other side. Machinery, cement, glass, rugs, teas and dry-goods shipments constitute the bulk of the return cargo.

Many large dry-goods firms in the United States make weekly shipments from Paris and London via the American line steamers.

The steamers of this line carry a light mail on the return voyage, as the English steamers take most of the mail from this port, giving only the "left over" mail and some most important "late" mail for the American liners.

The American steamers start for the home-land from the Empress dock at noon (Greenwich time) each Saturday. It takes about two hours to reach the Needles on the return trip. A few miles out from this point the channel pilot is dropped and the return trip fairly begun.

QUESTION SUMMARY.

1. Discuss the freight traffic of passenger steamers from New York to England.
2. What are the usual differences between cost of transportation and the location on board ship of the classes of passengers from New York to Southampton?
3. Follow the St. Louis from her North river pier to Sandy Hook, on her outward voyage.
4. Describe a ship's log.
5. When do vessels follow the "southern route" across the Atlantic? Why?
6. What is the usual program of meals for a steamer?
7. What are the ship's "watches"?
8. Tell the coal consumption and the number of furnaces of our ship.
9. Describe the "course line."
10. What is the business of the pilot?
11. Name and describe the two invaluable instruments that aid the pilot.
12. What is the log-book, and what should it show?
13. What is a "tramp" ship?
14. How is a regular liner told at sea?
15. How do vessels communicate at sea?
16. What charitable institutions are supported largely by mid-ocean entertainments on American line steamers?
17. Where is the most dangerous part of the English Channel?
18. Why is the Eddystone Reef so dangerous to navigation?
19. Describe the Eddystone lighthouse.
20. Between what two points is time reckoned on a New York-Southampton voyage?
21. What is the usual time recorded for a voyage between New York and Southampton?
22. What value does the navigator attach to the location of the Isle of Wight?
23. Name the advantages of Southampton as a shipping port.
24. Why do American line steamers bring heavy mail from New York and carry a light mail back?
25. What constitutes the cargo of vessels from Southampton to New York?
26. Describe the location and size of Southampton.

CHAPTER VIII.

Our Consular Service.

A CONSUL is an officer whom the nation stations in commercial centers of foreign countries, to protect its trade, and represent the nation's commercial interests in that port or district. The custom arose during the twelfth century, when the Italian cities appointed officers to represent the trading companies of the home city in the other Italian cities. By the sixteenth century all the commercial nations of Europe had adopted this Italian system; and when our government was formed, Congress took steps to empower the Secretary of State to form a consular system. The law of 1792 established this system, and Thomas Jefferson, Secretary of State, appointed our first consuls, whose compensation was to be obtained from fees received for services performed. The consuls were to be the nation's representatives at certain specified ports, to look after the commercial interests of the nation, and have nothing to do with political affairs, which belonged to the diplomatic service, organized about the same time by the same officer, the Secretary of State. By this first law the Secretary of State had the right to appoint. A number of times, Congress attempted to grade or rank the consular service, but it was not until 1856 that any special change was made. By a statute law of Congress, passed that year, the President was empowered to appoint consuls, subject to approval of

the Senate, and the service was divided into the following grades (according to importance):

1. Consul-General. This officer has charge over a consular district and all consuls within that district. There are thirty-eight U. S. Consuls-General at present.

2. Consul. This officer is sent by his government to a specified port, and upon arrival at the stated port his first duty is to exhibit his commission to the authorities of the government to which he is accredited, to obtain sanction of appointment. This sanction is a document entitled an "exequatur," and secures to him such privileges, immunities and exemptions as his predecessors enjoyed, and that are usually granted to consuls of foreign countries by the government of the nation controlling the port to which he has been sent.

The consul's chief duties are as follows:

(*a*) To register and report arrival and departure of every ship of his nation's flag that visits his port.

(*b*) To inspect and sign invoices of above-named ships' cargoes.

(*c*) To forward a list of passports signed or "viséd" (examined and indorsed).

(*d*) To send the State Department a list of marriages and deaths of his nation's citizens within his jurisdiction.

(*e*) To furnish the State Department with a list of his nation's citizens living within his district.

(*f*) Must report to his consulate (or State Department if no consul-general has jurisdiction), quarterly, his report covering all transactions, receipts, expenditures, etc., of the quarter.

(*g*) Must frequently inform consulate or secretary of the sanitary condition of the port, and furnish such other statistics as shall be important to his nation. (Under this latter head, statistics on commerce, navigation, manufacturing, emigration, agriculture, tonnage and harbor dues, lighthouse service, and finances of all principal commercial nations of the world, have been obtained through our consulates.)

(*h*) The American consul can be employed by the individual citizen to assist him in the transaction of private business. The consul can administer oaths; take testimony; deeds executed by him are valid; he may administer on the estates of Americans dying abroad, and can send home the proceeds of the estate to be distributed to the legal heirs.

(*i*) In Japan, Turkey, and China, any American charged with crime is tried by the American consul of the district in which the crime was committed.

(*j*) The seaman may apply to the consul for the protection of his legal rights, and the destitute mariner of an American vessel is entitled to receive relief from the consul at the expense of the United States Government.

(*k*) The chief duty of a consul is to see that the commercial laws of his nation are complied with at his port. There are at present 250 American consuls at foreign ports.

3. Commercial Agent. This officer is stationed at a commercial port of minor importance, yet the trade of which justifies the maintaining of a consular agent, to do all he can to assist his fellow-citizens in their trade relations, and send reports to the home government pertaining to matters of general commercial interest. At present the United States maintains twenty-five commercial agencies.

Until recently, no special qualifications were required for the consular service, and no specified term of office was named. Under these conditions the better positions were frequently looked upon as party "plums," and too frequently the service suffered in the payment of "party debts," "political rewards," etc. An executive order from the President September 20th, 1895, provided that all vacancies then or thereafter existing in a consulate or commercial agency, when the salary is between $1000 and $2500, shall be filled by (*a*) transfer or

promotion of a competent person; (*b*) by appointment of a person whose ability has been proven by former service in the Department of State; (*c*) or by appointment by the President of a person who, by examination of a board of three persons selected by the Secretary of State, shall be found qualified for the duties of the office. This order has been quite helpful in strengthening the consular service, as it brings to the service competent men, and does not so frequently deprive the service of men whose experience makes them most valuable consuls. England requires her consuls to pass a test before entering the service. They must be able to read and write fluently in the language of the country to which they desire to be sent, and to be thoroughly familiar with the commercial usages of said country. France educates her consuls especially for the service, and each candidate must receive a diploma from a national school before he can enter the service. He then enters the lowest rank, and must have three years' successful service in the lower order before he can gain promotion to a higher rank in the service. The same, or a similar plan, for selection of consuls, is followed in Germany, Belgium, Austria, Italy, and other European commercial nations.

SALARIES.

The British consul at New York receives $12,500; French, $12,000; German, $10,000; Russian, $10,000. New York is the most important commercial port in America, and indicates the maximum salary paid consuls by the above nations. The American Consul-General at London receives $5000; at Paris, $5000; at Berlin, $4000; at St. Petersburg, $3000. This illustrates the maximum salary our nations pays its consuls.

If the diplomatic service should make the consul the minister resident, the salary is made commensurate with the rank. To illustrate: H. N. Allen, Consul-General at Seoul, Korea, is now minister resident as well, and receives $7500. This is the highest salary paid a consular officer.

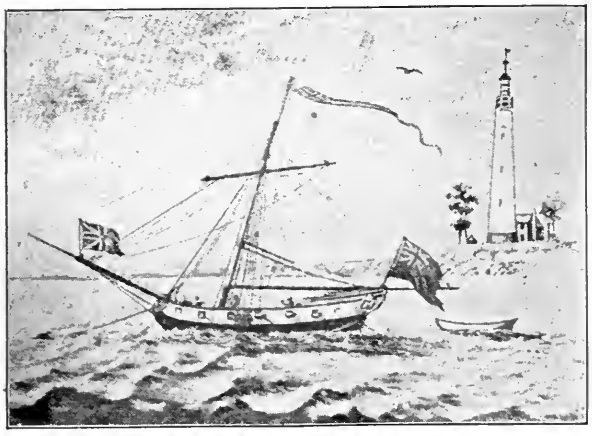
The consuls-general receive salaries as follows: One receives $1500 per year; three, $2000; one, $2500; thirteen, $3000; two, $3500; seven, $4000; one, $4500; nine, $5000.

The consuls receive salaries as follows: One (at Liverpool) receives $5000 per year; five, $3500; twenty-two, $3000; thirty-three, $2500; sixty-three, $2000; seventy-five, $1500.

The rest of the consuls receive a salary of $1000, or a salary determined by the fees collected. The salary of the commercial agent is determined by the fees collected, and varies from $800 to $1500, the average being $1000 per year. There are many clerks and agents of the service, besides the officers of rank. These agents generally receive a monthly salary. Besides the above are special consular clerks who are members of the consulate in the largest commercial ports. Counting the agents and clerks with the officers of rank, it gives 750 in our nation's consular service.

QUESTION SUMMARY.

1. What is a consul?
2. What municipalities in what century appointed the first consuls?
3. For what purpose?
4. When, may we say, all commercial Europe had consuls?
5. When and by whom was our consular system established?
6. When was the President empowered to appoint consuls?
7. Name the grades of the consular service.
8. Name the chief duties of the Consul-General.
9. Name the chief duties of the Consul.
10. What is the essential difference between a Commercial Agent and a Consul?
11. Why were consulates long considered significant party offices? *Ans.*, Because no special qualifications were required and no specified term of office was named.
12. When and how was this changed?
13. What has been the result to the consular service?



First Lighthouse built within limits of the United States (Boston Harbor).

14. State some facts in reference to the English consular service.

15. What are some requirements in the French consular service?

16. How do the salaries paid American consuls compare with salaries paid ranking European consuls?

17. Who is the highest paid consular officer? Why?

18. What are the nature and object of the consular reports published by the Government?

19. The Commercial Museum of Philadelphia receives the consular reports of every commercial nation. Its tabulated facts are considered invaluable to American commerce. Can you tell why?

20. Locate our nation's consuls-general. *Answer:*

Name of City. *Where?*	*Name of City.* *Where?*
Antwerp, ——.	Monrovia, ——.
Apia, ——.	Monterey, ——.
Bangkok, ——.	Montreal, ——.
Barcelona, ——.	Ottawa, ——.
Berlin, ——	Panama, ——.
Bogota, ——.	Paris, ——.
Cairo, ——.	Rio de Janeiro, ——.
Calcutta, ——.	Rome, ——.
Cape Town, ——	St. Gall, ——.
Constantinople, ——.	St. Petersburg, ——.
Dresden, ——.	Santo Domingo, ——.
Frankfort, ——.	Seoul, ——.
Guatemala, ——.	Shanghai, ——.
Guayaquil, ——.	Singapore, ——.
Halifax, ——.	Stockholm, ——.
Hong Kong, ——.	Tangier, ——.
London, ——.	Teheran, ——.
Melbourne, ——.	Vienna, ——.
Mexico, ——.	Yokohama, ——.

CHAPTER IX.

The Light Stations of Our Nation.

Lighthouses are of quite ancient origin. The first one known to authentic history was the Pharos of Alexandria, built about 285 B. C.— over two thousand years ago. The oldest existing lighthouse is believed to be the one at Corunna, Spain, which was built in the reign of Trajan, in the second century, A. D.; and was reconstructed in 1634.

The lighthouse or light-ship is a great aid to commerce, being located at dangerous places on ocean and lake shores. "With the lighthouse rays, always come the many and the richly laden vessels of commerce," says Mr. A. B. Johnson, chief clerk U. S. Lighthouse Board.

Europe is, and for many centuries has been, the great commercial continent of the world. She is well provided with lighthouses, as the following table shows. This table was prepared by Mr. Johnson, of our own lighthouse board, in 1890:

LIGHT STATIONS BY CONTINENTS.

Europe	3,309
North America	1,435
Asia	476
Oceanica	319
Africa	219
South America	167
Total	5,925

Of the total number of stations on this continent, the Dominion of Canada has 443, Newfoundland

Shoal Light Station, Virginia Coast.

51, Mexico 15, British Honduras 7, Central America 11, West Indies 106, and the United States the rest,— more than one-half that the continent provides.

The lighthouse system of our nation is said to have practically begun with our commerce. As early as 1673, Nantasket citizens sent a petition to the court of the Province of Massachusetts Bay, asking that the general taxes be reduced on account of the labor and expense in building the beacon-light at Point Allerton. Four hundred boat-loads of stone were used in erecting a base for this beacon. The beacon consisted of an iron basket, in which were burned "fier-balls of pitch and ocum." The first lighthouse on this continent was built on Little Brewster Island, at the entrance of Boston harbor, in 1715–16, at a cost of 2286 pounds sterling, and was supported by light-dues of one penny per ton, levied by the collector of imports of Boston on all incoming and outgoing vessels, except coasters. Other maritime colonies followed the example of Massachusetts in establishing lighthouses, and when the United States, in 1789, accepted the title to and joint jurisdiction over the lighthouses of the coast, there were eight in number, located as follows:

1. Portsmouth Harbor Light, N. H.
2. The Boston Light, Little Brewster Island.
3. The Gurnet Light, near Plymouth, Mass.
4. The Brant Point Light, Nantucket, Mass.
5. Beaver Tail Light, on Conanicut Island, in Narragansett Bay, R. I.
6. Sandy Hook Light, entrance to New York harbor.
7. Cape Henlopen Light, entrance to Delaware Bay.
8. Charleston Main Light, on Morris Island, Charleston, S. C.

The Federal Government placed this department under the direction and care of the Secretary of the Treasury. In 1792 the office of Commissioner of Revenue was created, and the superintendence and control of the light stations devolved upon him. This was a temporary officer; and in 1820 we find the Fifth Auditor of the Treasury Department having supervision of the U. S. Light Service. This officer was Mr. Stephen Pleasanton, and he proved a most efficient officer, having charge of this department until the creation of the Lighthouse Board, in 1852. During Mr. Pleasanton's term as General Superintendent of Lights — thirty-two years — we find the number of lighthouses increased from 55 to more than 325 lighthouses and light-ships, with numerous buoys and monuments as aids to navigation.

By act of Congress in 1838, the lighthouse system was divided into districts by the President, and an officer of the navy was detailed to each district with a revenue cutter or hired vessel, with instructions to make a careful examination of the light stations in his district and report to General Superintendent Pleasanton, who in turn was to report to Congress. From the general report thus obtained the plan for the present system had its origin.

In 1845, Secretary of the Treasury Walker had Lieutenants Thornton A. Jenkins and Richard Bache detailed from the navy to study the lighthouse systems of Europe, especially France and Great Britain. They were directed to procure information as to the organization of lighthouse systems, construction of lighthouses, expense, character and efficiency of lights, and study buoys and lighting apparatus used abroad. These men spent a year in Great Britain and on the Continent; and several months, after their return to this country, were spent in inspecting our own lighthouses and their needs. These men sent in a careful and most valuable report, recommending changes in administrative affairs, in arrangement of districts, and lights to be used. In presenting this report to Congress, Secretary of the Treasury Walker closed with the following remark: "It is obvious that a very considerable range of practical and theoreti-

cal knowledge is required for the improvement of the system; more than can be looked for from one individual, however eminent in science."

The proper organization of the system, and planning of its details, require the efficient head of a bureau familiar with the working of a general organization,— a person capable of furnishing information in regard to the coasts and harbors from actual surveys; persons minutely acquainted with the wants of navigation, with the details of location and construction of the lighthouses, and with the chemical and mechanical principles involved in lighting. While this knowledge cannot be obtained from one person, a board may be organized, without expense to the Government, by which the system may be considered in all its particulars and an efficient plan of action recommended.

In May, 1851, by authority of Congress the Secretary of the Treasury appointed a board of six to make a detailed report and program to guide legislation in extending and improving the system of construction, illumination, inspection and superintendence of the lighthouse system of the Government. Lieutenants Jenkins and Bache were both members of this Board. Congress acted upon their report, and passed an act in 1852 establishing the Lighthouse Board as it at present exists.

The Lighthouse Board consists of two officers of the navy, of high rank, two engineer officers of the army, two civilians of high scientific attainments, together with an officer from the army engineers as secretary. The Board is under the superintendence of the Secretary of the Treasury, and is intrusted with "all administrative duties relating to the construction, illumination, inspection and superintendence of lighthouses, beacons, buoys, sea-marks, and their appendages, and embracing the security of foundations of existing works, procuring illuminating and other apparatus, supplies, and materials of all kinds for building and keeping in good repair, buildings, vessels and buoys of the United States." The Board has marked the coasts of the nation into lighthouse districts. An inspector, who must be either an army or navy officer, is assigned to each district, as well as an engineer officer of the army. The inspectors are charged with the maintaining of lights and lighthouses and the discipline of the light-keepers. The district engineers, under direction of the engineer secretary, are charged with the building of lighthouses, with keeping them in repair, together with the purchase, setting up and repair of the illuminating apparatus.

The present Board has built up a corps of intelligent light-keepers, who come up from the lowest rank of the service by examination, and in this way receive promotions, with corresponding increase in pay. The term is practically during good behavior. The average pay of a lighthouse-keeper is $600 per year. The United States employs at the present time 1400 lighthouse- and fog-signal-keepers.

The lighthouse service is a training-school for young officers. The roll of lighthouse inspectors is said to contain the names of the flower of the navy. The lighthouse engineers enroll many who have established a name for army engineers in solving problems of submarine construction, and whose monuments are world-famous lighthouses which they have constructed.

The light districts of the United States, with boundary limits, are as follows:

District No. 1, head of navigation St. Croix river, to Hampton Harbor, N.H., 74 lights in 1900.

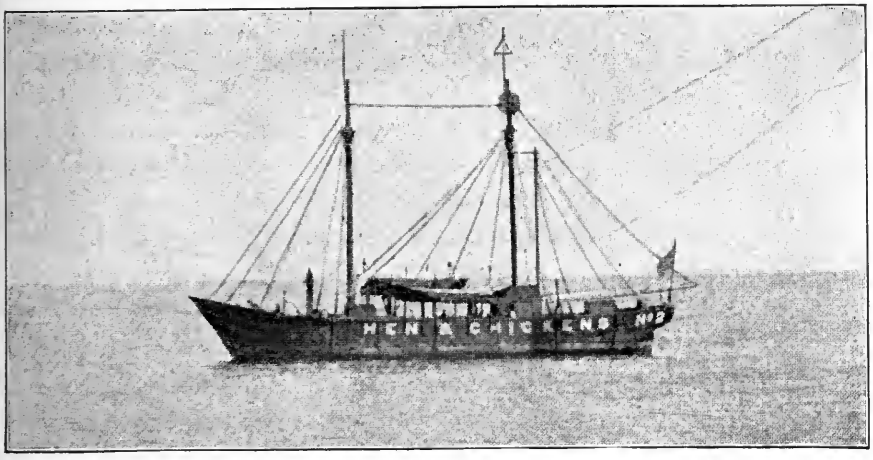
No. 2, Hampton Harbor, N. H., to Elisha Ledge, off Warren Point, R. I., 90 lights.

No. 3, Elisha Ledge to Shrewsbury Rocks, New Jersey coast, 260 lights.

No. 4, Shrewsbury Rocks to Metomkin Inlet, Va., 72 lights.

No. 5, Metomkin Inlet to New River Inlet, N. C., 142 lights.

No. 6, New River Inlet to Jupiter Inlet, Fla., 59 lights.



"Hen and Chickens," Light Vessel No. 2, Massachusetts.

No. 7, Jupiter Inlet to Perdido Entrance, Fla., 197 lights.

No. 8, Perdido entrance to southern boundary of Texas, 100 lights.

Nos. 9, 10, 11, region of the Great Lakes, 414 lights.

No. 12, southern boundary of California and northern boundary, 46 lights.

No. 13, from southern boundary of Oregon to northern boundary of the United States, including Alaska, 139 lights.

No. 14, from Pittsburg, Pa., on Ohio river, to Cairo, Ill., 966 miles, with 300 miles of navigation on tributary rivers, 508 post and floating lights.

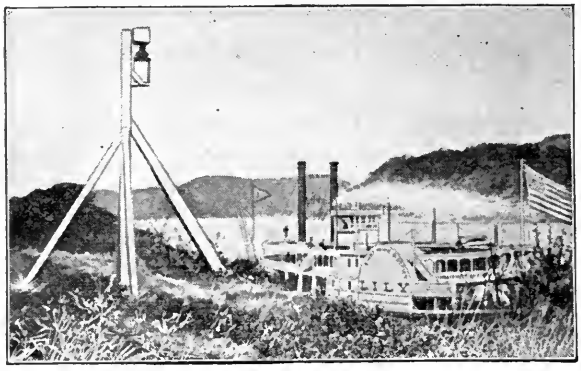
No. 15, from head of navigation at the Mississippi river to Cairo, Ill.; Missouri river to Kansas City; Illinois river from LaSalle to mouth, 359 post and floating lights.

No. 16, from Cairo, Ill., to New Orleans, La., 358 lights.

Lighthouses are always placed at that point or place on the coast that is considered dangerous to commerce, and if a lighthouse seems impracticable at that point, a light-ship is placed there, or a whistling-buoy. To further aid the mariner in thick or foggy weather, the Lighthouse Board has placed fog signals. With a fog signal on the coast and one in the harbor, the mariner can be guided to his anchorage. Sailors are coming to believe that they can be guided by sound as certainly as by light. About 100 fog signals are now operated by either steam or hot air. It cost $600,000 to establish these signals, and the yearly expense to maintain them is about $100,000.

A word should here be said about the river lights. On account of obstructions in channels and the tortuous course of the channels of the rivers, commerce on Western rivers was formerly restricted to daylight motion. As over a thousand steamboats, carrying a yearly commerce of 1,200,000 tons, were employed on the Mississippi, Ohio and Missouri rivers, as early as 1873, it was an important question how to protect and foster this commerce of at least $400,000,000 per year. In 1874 a survey for temporary lights and buoys was made, and upon the report of the committee recommending the extension of light service to these rivers, the Lighthouse Board appointed inspectors and engineers, districted the rivers, and proceeded to establish lights.

Detroit River Light Station, Michigan.



Ohio River Post Light, and Lighthouse Steam Tender "Lily."

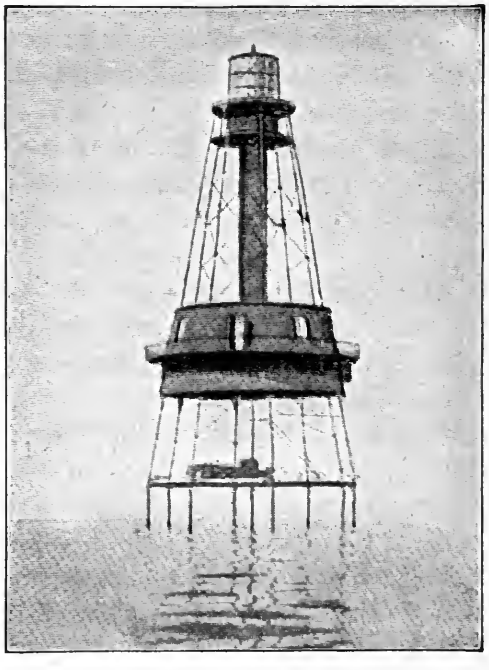
These lights I will here describe. The lens lantern is suspended from an arm projecting from a post, or is placed on the post, at an elevation of eight or ten feet from the ground. At points where the channel is made dangerous and narrow by permanent obstructions, buoys have been placed as day marks, to which lights are attached as night signals. The post lights are placed at such points as present needs demand, and are changed as the current changes or "blind crossings" appear. Keepers for these lights are selected from among the people living along the river who have been found trustworthy and awake to the demands of the light service.

There are on the three rivers mentioned more than twelve hundred of these lights, costing on an average $156.28 each per year for maintenance. So helpful have they been to commerce, that the system has been extended along other rivers; so that more than sixteen hundred post lights are maintained now along 5000 miles of river navigation.

We will now speak of the construction of the lighthouses. Previous to 1840 all lighthouses on the New England coast were either conical towers of rubble-stone masonry, or wooden frame towers erected on the roofs of the keepers' dwellings. Since then the construction of the lighthouse has depended on the nature of the ground where erected, the sea exposure, and the amount of Congressional appropriation for lighthouse construction.

Within twelve years three successive stone towers were demolished at the Black Rock Beacon, on Long Island Sound, four and one-half miles from Bridgeport, Conn. Then the iron-pile beacon was put in (1847), that is standing to-day. As excavation was made, and six twelve-ton stones were fitted close together, bedded in concrete. Into these stones were set five wrought-iron periphery piles and one center pile, measuring three to five and one-half inches in diameter. These piles are solidly joined together, and capped at the top. The stone towers are 31 feet high, and together cost $21,000. The pile beacon is 34 feet above low water, and cost but $4000.

The Carysfort Reef Light is another example of the iron-pile system. This stands on a coral reef, below which is a softer mass of calcareous sand. Here large iron foot-plates were used to diffuse the pressure over 130 square feet of surface

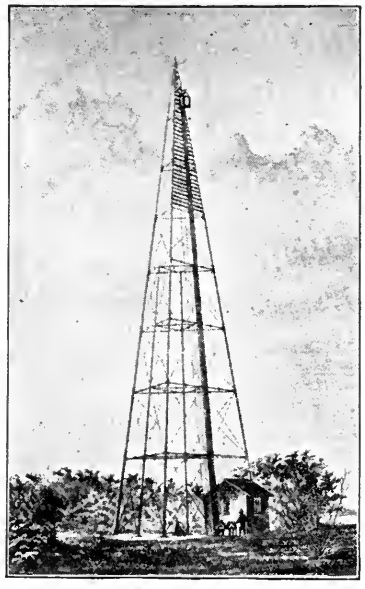


Carysfort Reef Light Station, Florida.

crust. Nine eight-inch piles placed in the form of an octagon were passed through center eyes in the iron plates, and driven ten feet into the sand. Cross-ties and braces give rigidity to the structure, and the keeper's house is an elevated one, built in the structure. The light is 112 feet above low water. This tower with its apparatus cost $105,000, and was completed in 1852.

One of the most important of the iron-pile lighthouses is the Sombrero Key lighthouse, on Florida Reefs, about 50 miles east of Key West. Its light is 140 feet from the water, and has a range of twenty miles at sea. The frame is pyramidal in shape, is in six sections, and has a diameter of 56 feet at bottom and 15 feet at the top. The keeper's dwelling is in the second section, made of boiler-iron lined with wood. A circular stairway ascends to the lantern, which is also of boiler-iron lined with wood. This structure cost $120,000, and although built fifty years ago, is still in excellent condition. The iron-plate towers are composed of cast-iron panels weighing 1200 pounds; the panels in a section are of exactly the same size, so each one may occupy any position in the ring they form when put together. These plates are provided with flanges, so as to connect the several tiers of plates, and the plates of each tier are securely bolted into the succeeding tier. The whole structure rests generally on a concrete foundation, to which the lower section of the tower is fastened by anchor bolts built into the concrete. One value of this system is, that when necessity requires, the lighthouse can be readily taken down and moved.

Sombrero Key Light Station, Florida.



Rear Beacon, Paris Island Rouge, South Carolina.

The Hunting Island lighthouse (South Carolina) was first built in 1875, a quarter of a mile from the beach. But on account of the erosion of the land by the sea it has had to be taken down and moved a mile and a quarter farther inland. The original cost of this lighthouse was $102,000.

Where the soil affords an inadequate support for a masonry foundation, or where great cheapness is required, iron skeleton towers are erected. The light at the Southwest Pass of the Mississippi illustrates this form, as does the Paris Island Rouge Light, of Port Royal Sound, S. C. This

Tillamook Rock Light Station, Oregon.

latter is a triangular pyramid, 132 feet high, resting on six circular iron disks anchored to a concrete foundation. The plan of this light was born of necessity, as Congress failed to appropriate a fund sufficient to build the light the Board had planned for. The light used is a locomotive headlight in the form of a powerful parabolic reflector. The light is housed by day and run up to the apex of the triangle, by machinery, at night. This is said to be the most economical light station in our nation, the entire structure costing but $12,000.

The St. Augustine Light is a good illustration of the substantial brick towers. Its spiral stripes, used to distinguish it from adjacent sea lights by day, are familiar to all geography students. Our nation has from eight to ten similar brick-tower lights.

Minot's Ledge, Massachusetts, is our best representative of the stone-tower lights. General Bernard, a great civil engineer, says of Minot's Ledge Light: "It ranks, by the engineering difficulties surrounding its erection and by the skill of science shown in the details of its construction, among the chief of the great sea-rock lighthouses of the world." This lighthouse was completed in 1860, at a cost of $300,000.

Probably the most interesting lighthouse in this country is the Tillamook Rock lighthouse, on the Pacific coast, twenty miles south of the mouth of the Columbia river. The Tillamook rock is ninety-two feet above the sea; is very steep on three sides, and so dangerous to vessels that in 1879 our Government decided to build a lighthouse on the rock. It was with great difficulty that a working party could be landed, and it took more than two years to complete the work. The Pacific rolls and surges about Tillamook in such a manner that it is one of the wildest spots on earth. So terrifying is this place that the keeper has to have a companion, and a piano has been placed in the keeper's house as a healthy diversion for both men. During a storm ten years ago the waves broke off a chunk weighing ninety pounds, and flung this fragment entirely through the lamp, 136 feet above. Often seas dash waves twenty and even thirty feet above the lamp, breaking the glass plates surrounding the light. Just one month before this lighthouse was completed, an English vessel of 1040 tons burden was dashed to pieces on shore one mile from Tillamook, and ship, cargo and crew were lost.

Lighthouses receive their supplies from a small vessel called a "tender," that visits the light about once a month. The tender takes supplies, and brings back the keeper's reports to the inspector and letters to relatives and friends. Twenty-two of these vessels are employed on the Atlantic and Gulf coasts, three on the lakes, three on rivers, and two on the Pacific coast.

The lighthouse lamp is surrounded by a ring of lenses, which revolve by clockwork. Each lens throws a beam like a searchlight, and as each beam rests on the spectator only an instant, the light comes to the sailor in flashes. The number of seconds these flashes are apart, together with the color of the lenses, indicates to the sailor what lighthouse it is. The most of the heavy lamps float in mercury, to make them turn easier. These lamps attract wild ducks and sea birds, and hundreds of them dash themselves to death against the plate-glass frame surrounding the lamp.

The Fresnel lenticular apparatus is used in our lighthouses. Mr. Alan Stevenson, the great Scotch lighthouse engineer, says of this lamp: "Nothing can be more beautiful than an entire apparatus for a fixed light of the first order. It consists of a central belt of refractors, forming a hollow cylinder 6 feet in diameter and 30 inches high; below it are six triangular rings of glass, ranged in a cylinder form, and above a crown of thirteen rings of glass, forming by their union a hollow cage, composed of polished glass 10 feet high and 6 feet in diameter. I know of no work of art more beautiful or creditable to the boldness, ardor, intelligence and zeal of the artist." The cost of these first-class lights varies from $4250 to $8000. The glass used varies from first order to sixth order, which is 11¾ inches in diameter and costs from $200 to $300.

A lighthouse-keeper stands by his light as long as the lighthouse stands, and these brave men will no more desert their posts in time of danger than an American soldier will leave his gun on the advance of an enemy. The heroism of a Grace Darling actuates the entire corps, and the great value of the lighthouse system of our nation in its protection of life and property on the high seas can scarcely be overestimated.

QUESTION SUMMARY.

1. State the origin of the lighthouse.
2. Who is believed to have built the oldest lighthouse now in existence? In what century?
3. Why is the lighthouse a factor of commerce?
4. What continent has more than half the lighthouses of the world?
5. How do you account for this?
6. Rank the continents by the number of their light stations.
7. Discuss Point Allerton beacon of the seventeenth century.
8. Where and when was the first lighthouse built in America?
9. What American colony led in establishing lighthouses? Why?
10. How many light stations on the Atlantic coast when our Federal Government was established, in 1789?
11. Name and locate these stations.
12. Discuss the work of Mr. Pleasanton while General Superintendent of Lights.
13. What is a light-ship, and where generally located?
14. When did an act of Congress establish lighthouse districts, and what can you say of the results?
15. Describe Jenkins and Bache's tour of inspection.
16. What led to the establishment of a lighthouse board?
17. Explain the personnel of the Lighthouse Board.
18. Name the administrative duties of this board.
19. Who are appointed lighthouse inspectors, and what are their duties?
20. Who are appointed district engineers, and what are their duties?
21. How many lighthouse districts on the Atlantic coast of our nation?
22. How many light districts on the Great Lakes?
23. How many light districts on the navigable rivers of the interior?
24. What rivers in these districts?
25. Give some conception of the commerce of these rivers.
26. Describe the character of the river lights.
27. How are keepers of these lights obtained?
28. What is the approximate total cost of maintaining post lights for the 5000 miles of river navigation now in the river districts?
29. What is the purpose of the fog signal, where placed and how operated?
30. The 100 fog signals cost what sum in construction?
31. What does it cost to maintain them?
32. The material used in the construction of a lighthouse usually depends upon what?
33. Describe the construction of the iron-pile Black Rock beacon of 1847.
34. Describe the Sombrero Key lighthouse on Florida Reefs.
35. What is the best representative of the stone-tower lights? Why?
36. Where is the Tillamook Light?
37. What determined the establishment of a lighthouse on Tillamook Rock?
38. Give facts that demonstrate this to be one of the wildest spots on earth.
39. What is the lighthouse tender?
40. Describe a lighthouse lamp?

Life-Saving Station, near Cliff House, San Francisco, California, U.S.A.

41. Where is a locomotive headlight used for the lamp?

42. Who was Grace Darling?

43. What is the average salary of our lighthouse-keepers?

44. What can you say of the character of these men?

45. How would you estimate the value of lighthouses to commerce?

CHAPTER X.

The Life-Saving Service of the United States.

THE Royal National Lifeboat Institution of Great Britain is called the honored mother of all existing life-saving organizations among the nations of the world.

Our present system is of recent origin, but our Government was erecting boat-houses along the Atlantic coast during the second quarter of the nineteenth century, completing its contemplated plan in 1850. It supplied these boat-houses with surf-boats and other life-saving appliances, and acted in conjunction with municipal and State authorities in saving life and property along storm-frequented coasts. It was almost a volunteer service, but we can form little idea of its effectiveness, as no records were kept of its work. The very efficient organization known as "The Massachusetts Humane Society" was an outgrowth of these volunteer life-saving crews, and while it has since broadened its work, it still carries on a most effective life-saving department, with many stations along the Massachusetts coast.

The present system of life-saving service was called into being in 1871, and by act of Congress the system was organized. The first stations were established on the coasts of New Jersey and Long Island. In 1872 the coasts of Cape Cod were added. The remaining coast of New England and the Atlantic coast from Cape Henry to Cape Hatteras were added in 1874; the coast from Cape Henlopen to Cape Charles was added in 1875; the eastern coast of Florida and portions of the lake coasts in 1876; the Pacific coast in 1877–78; and in 1880 the coast of Texas was included in the territory of operation in the National Life-Saving Service.

There are now 10,000 miles of sea and lake coasts under the Service regulations. This area is divided into twelve districts, with life-saving stations as follows:

First District (coasts of Maine and New Hampshire), 14 stations.
Second District (coast of Massachusetts), 29 stations.
Third District (coasts of Rhode Island and Long Island), 41 stations.
Fourth District (coast of New Jersey), 42 stations.
Fifth District (Atlantic coast from Cape Henlopen to Cape Charles), 18 stations.
Sixth District (Atlantic coast from Cape Henry to Cape Fear river), 31 stations.
Seventh District (coasts of South Carolina, Georgia, and eastern Florida), 10 stations.
Eighth District (Gulf coast), 8 stations.
Ninth District (coasts of Lakes Erie and Ontario and the Louisville* Station), 12 stations.
Tenth District (coasts of Lakes Huron and Superior), 17 stations.
Eleventh District (coast of Lake Michigan), 28 stations.
Twelfth District (Pacific coast), 15 stations.
Total number of stations, 265.

*At Louisville, Ky., dangerous falls occur in the Ohio river. For this reason it has been found advisable to have at this point a floating station.

By act of Congress of June 18, 1878, an investigation is required to be made, of all the circumstances connected with the shipwrecks occurring within the scope of the operations of the Life-Saving Service, involving loss of life, with a view of determining "the cause of the disaster, and whether any of the officers or employés of the Service have been guilty of neglect or misconduct in the premises." This was a most valuable provision, as it caused a detailed account of each disaster to be recorded and gives the Service valuable data of its work.

In 1883 a uniform wage system was established, and has proven itself quite an effective element in the success of the Service.

The chief or highest officer is the General Superintendent, appointed by the President and confirmed by the Senate. The law places no limit as to his term of office, which is therefore subject to the pleasure of the President. No one is eligible to this position who is not thoroughly familiar with the means employed by the Service to save life and property from shipwreck. This officer has administrative control over the entire service. His salary is $4000 per year.

An Assistant General Superintendent is appointed by the Secretary of the Treasury, and in absence of the General Superintendent performs duties of the same, acting as chief adviser and assistant at all other times. This officer's salary is $2500 per year. The general headquarters of the Superintendent of the Service are at Washington, D. C., where a corps of clerks, a civil engineer, a topographer, a hydrographer and a draughtsman assist in the transaction of business.

A board on life-saving appliances, composed of experts obtained from the Life-Saving Service and other sources, is appointed, which examines and reports upon the devices and inventions for the improvement of life-saving apparatus. This renders the Service progressive and provides it with the latest and most effective apparatus.

The next ranking officer is the Inspector, detailed from the revenue-cutter service, upon request and recommendation of the General Superintendent. His headquarters are in New York city. Under him are assistant inspectors,—one for each district,—whose business it is to visit each station in the district at least once a month, during the "active season." This assistant inspector is to examine and practice the station crews and make the ordinary routine of inspection, and also make a careful examination of all persons who have entered the Service since his last visit, reporting to the Inspector for dismissal any found wanting. In case of a shipwreck where loss of life occurs, it is his duty to carefully investigate all the circumstances, and, if possible, obtain the cause of disaster, reporting to the Inspector; also, whether officers or employés of the Service were guilty of any neglect or misdemeanor.

Each one of the twelve districts into which the United States coasts are divided is controlled by a superintendent, who must be not less than twenty-five nor more than fifty-five years old when appointed. He must be a person of good character, must have a good knowledge of business affairs, and be able to read and write English readily. He must not only be a resident of the district for which chosen, but must also be thoroughly familiar with the line of coast embraced within its limits; and understand the management of lifeboats and other life-saving appliances. For this reason, to gain the appointment each superintendent must pass a rigid examination as to these qualifications, given by the General Superintendent and Inspector. Besides being disbursing officers and paymasters for their respective districts, they conduct the general business of the district, visit each station at least once a quarter, to pay off the crews and provide station needs. They make requisition on the General Superintendent for station supplies, apparatus,

and repairs, and also look after the interests of the Government in reference to dutiable property wrecked within district limits, and see that keepers of stations perform their duties in reference to this and all matters in their charge.

The salary of the superintendent varies from $1000 to $1800 per year, determined by the extent of duties and measure of responsibility.

The most important officer in the entire Service is the keeper of the station, who has control of all its affairs. For this reason he is selected with the greatest care. The candidate must be not less than twenty-one nor more than forty-five years of age, a person of good character, able-bodied, and must hold a certificate of physical soundness from a surgeon of the Marine Hospital Service. He must also have sufficient education to transact the business of the station, and be a master of boat-craft and surfing. He is generally nominated by the district superintendent and appointed by the General Superintendent. The keeper is required to reside constantly at his station; has the custody of station property and control of station premises. He is captain of the station crew, leads them and shares their perils on all occasions of rescue, directing all operations with the apparatus. The keeper is guardian of all wrecked property until relieved by owner or agent of same, or instructed by superior authority as to its disposition. He is also, *ex officio*, inspector of customs, under direction of the district superintendent. He is required to keep a log-book or daily journal, sending a transcript each week to the district superintendent, who sends a duplicate to the General Superintendent at Washington. An immediate and complete report of each wreck must be sent by each keeper to his superintendent.

A keeper who lives in an isolated and lonely place is permitted to hire an assistant to stay with him during the period of the year the crew are "off duty," and is paid the maximum salary of $800 per year. The customary salary paid is $700 per year.

Keepers of houses of refuge receive $400 per year. The houses of refuge are simple dwellings with capacity and conveniences for the residence of a good-sized family, and sufficient to furnish temporary shelter for as many as are likely to need it. These houses are situated on the Florida coasts, and the distance between them averages twenty-six miles; guide-posts are placed at each mile, indicating direction and distance to nearest station. Cots and sufficient provision to keep twenty-five persons ten days are supplied each house of refuge. No apparatus or boats (save a small galvanized iron boat for keeper) are provided for these houses, as they are intended to succor rather than rescue the shipwrecked. The houses of refuge are manned generally by the keeper, with one and sometimes two attendants, but no crew of surfmen is maintained.

The stations of the Service usually consist of two-story houses arranged as follows: On first floor a boat-room, a mess-room, a keeper's room, and a storeroom where the life-saving apparatus is kept, —which will later be discussed. The second story generally contains two and frequently four additional rooms, one a sleeping-room for the men, another a rescue- and storage-room; and if two additional rooms, one is a rescue or spare room and the other a kitchen. Each station-house has an observatory tower or lookout and a sixty-foot flagstaff. The latter is used in signaling vessels. The roof of the station-house is painted a dark-red color, which makes it distinguishable a long way off-shore.

The floating station at Louisville is a house of two stories surmounted by a lookout, and is usually moored above the dam which spans the river, at a place easily accessible to boats. It can be towed wherever necessity requires. In 1883–4, the time of the great Ohio floods, it rescued 800 persons,

and took to places of safety and supplied food and other necessaries to more than 10,000 others.

Station buildings upon exposed coasts are built to withstand the tempests that frequent these coasts.

Instances are on record where storms have carried the station-house from a quarter to a half-mile inland, without material damage. In the terrible storm of February 3, 1880, which lined the coast of New Jersey with wrecks, in the very "teeth of the storm" three station crews, at dead of night, rescued all the passengers and crews of four vessels without a single mishap. When we learn that their beach apparatus was set up and worked in almost absolute darkness, the lanterns being so thickly covered with sleet that only the faintest glimmers of light were given out, too dim to reveal the lines and implements used, we know that these brave men must understand their business thoroughly.

To more efficiently guard the coast and prevent shipwrecks and bring quick assistance to the distressed, a careful system of patrol is maintained. During 1900, 182 wrecks were prevented by the night patrol with his red Coston handlight signal.

Gen. Supt. Kimball says that the Service would be made much more effective in its rescue work if all captains of ships' crews were taught how to intelligently coöperate with the rescue force.

When we know that the life-saving appliances are being continually improved, and that the work and limits of the Service are being extended, we can indeed be thankful for its protection to life and property. To gain a conception of the scope of its work, and to show how our Uncle Sam loves his citizens and seeks to afford the greatest protection to their shipping along his shores, permit me to say that he maintains 193 stations on the Atlantic and Gulf coasts, 56 on the Great Lakes, 15 on the Pacific coast, and one at the falls of the Ohio, Louisville, Ky. He maintains these stations at an average annual expense of $4000 per station, while the saving to the nation each year approximates six and one-half times the total cost, and over 4000 lives.

May we teach our scholars that the men in this service are heroes, whose courage and devotion to duty all Americans should know and appreciate.

QUESTION SUMMARY.

1. What was the origin of the modern life-saving organizations?

2. What life-saving appliances did the United States have prior to 1850?

3. When was the National Life-Saving Service of to-day established?

4. Where were the first stations located?

5. How many miles of lake and seacoasts now under this Service?

6. Into how many districts are these coasts divided?

7. Who is the highest officer of the Service, and how selected?

8. What are his duties, and where are his headquarters?

9. Explain the work of the board on life-saving appliances.

10. Explain the work of the inspector.

11. Where are his headquarters?

12. Who alone are eligible to the superintendency of a district?

13. Give the duties of this officer.

14. Who is the most important of the entire service? Why?

15. What qualifications are required of this officer?

16. What are the duties of the station-keeper?

17. What is the station log-book?

18. What are houses of refuge, and where are they located?

19. What supplies and equipment are kept by the keepers of these houses?

20. Describe a station-house in the Life-Saving Service.

21. What can you say of the Louisville station?

22. What can you say of station buildings on exposed coasts?

23. What incident in the storm of 1880 shows the efficient work of the U. S. Life Saving Service?

24. Explain the work of the coast night patrol.

25. What facts show the extent and value of the Service?

CHAPTER XI.

Great Canals of Commerce.

The first canals were dug by the ancient Egyptians and Chaldeans, for irrigation purposes.

Seventeen centuries before Christ the Chaldeans dug the Royal Canal of Babylon. Later Nebuchadnezzar reopened this canal, and so enlarged it that merchant ships could sail on it; and six centuries before Christ Herodotus considered it one of the wonders of the world.

About the seventh century after Christ the Imperial Canal of China was constructed, connecting the Pei-Ho with the Yang-tse, the boats being raised from lower to higher levels by means of inclined planes on which capstans were used.

In the twelfth century canals were introduced in the Netherlands, where they have become the principal means of internal communication.

In the fourteenth century two Italian engineers invented the modern lift-lock. This opened a new era in canal-building, and to-day nearly every country of commercial importance has increased its natural water-ways or enhanced their commercial value by artificial means.

Many cities, like Amsterdam, Manchester and New York, have by ship canals increased their commercial value as ports.

Amsterdam in the early part of the last century dug a canal 51 miles long, connecting the river with the North Sea; and near the close of the century Manchester dug her ship canal from tide-water, 35½ miles away, so that ships of 6000 tons burden could steam directly to the city.

In 1895 New York dug her canal connecting the Hudson river with Long Island Sound via Spuyten Duyvil creek and Harlem river.

From their commercial importance, the following canals deserve special mention:

1. *The Erie Canal.*—This canal is a memorial to the untiring energy of Governor DeWitt Clinton, of New York. The canal was begun in 1817, and was finished in eight years. The canal was built in sections, each as level as possible, and as the land is higher in some places than it is in others, these sections were connected by locks that raise or lower the boats as may be required. From Brighton to Lockport is a continuous level sixty-five miles long. At Lockport are five large double locks that have a total lift of 56 feet. These locks gave the name to the large commercial center the canal has built up here, and are examples of engineering skill.

From Lockport to Buffalo is a section-level 31 miles long. The original canal as dug was 363 miles long, extending from Buffalo to Troy and Albany, on the Hudson river. The transfer from one section-level to another is made by means of locks. There are seventy-two of these locks. A boat going west enters the lock and is shut in. Water is allowed to enter until the lock is filled, which raises the boat to the higher level. A boat coming east is let into the lock, the water sent out, and the boat brought down to the lower level, when it continues its journey.

This canal reduced freight rates from Buffalo to New York from $100 to $14 per ton, and finally to $3, and enabled people of the Northwest to obtain farming tools, clothing and other articles at one-eighth of their former prices. It stimulated settlements along the canal, and made New York city the distributing center for a greatly increased territory of trade.

In 1862 this canal was enlarged to 70 feet at surface of water, with an average depth of seven feet.

2. *The Caledonian Canal.*—This canal was being dug at the same time the Americans were constructing the Erie Canal. It was completed in 1822. This canal crosses Britain from the Loch Linnhe on the west, through the Highlands to the Moray Firth on the east. It makes use of four lakes whose combined length is 37 miles, while the canal proper is 23 miles long, 122 feet wide at surface of water, and 20 feet deep; making the

total distance of 60 miles. The canal has its sloping banks protected with stone-work, and vessels of 6000 tons burden can pass through the canal.

3. *The Suez Canal.*— This canal reaches from Port Said to Suez, and is a well-known short route to India. The canal was planned by the French engineer Ferdinand de Lesseps, and the construction was executed by a company under his direction. As first dug, the canal for four-fifths of its length was 327 feet wide at surface of water and 26 feet deep. For the remainder of the distance it was made 196 feet wide and 26 feet deep. The immense traffic of recent years has required the channel to be both widened and deepened. The canal proper is 66 miles long, and utilizes 21 miles of lakes, making the full distance 87 miles.

The canal cost in construction $16,000,000, is without locks, and was opened for commerce in 1869. A fresh-water canal from the Nile near Cairo parallels the salt-water canal, and, being 40 feet wide and 9 feet deep, is used for both irrigation and navigation. The Suez Canal reduces the distance from London to Bombay from over 11,000 miles to a little more than 6000 miles, while the trade of the world passes through this channel of commerce.

4. *The Baltic and North Sea Canal.*— This canal was opened in June, 1891. It runs from Holtman, Bay of Kiel, to Brunsbüttel, at the mouth of the Elbe river. It is 61 miles long, 27¾ feet deep, and 118 feet wide. This canal is of great strategic value to Germany and of great commercial value to Prussia. The time saved steamers from Kiel to Hamburg is two and one-half days, and the largest war and merchant vessels of the empire can pass through the canal.

The Empire paid two-thirds of the cost of construction and the kingdom of Prussia the remaining third. The total cost was $7,128,000.

5. *The Sault Ste. Marie Canal.**— The "Soo" canal, as this is popularly called, is but three miles long, yet its importance commercially is so great, Americans are prone to think it the greatest canal in the world.

Egyptian Beef for the great Ocean Liners anchored in the Suez Canal, Port Said.

This canal connects Lake Superior with Lake Huron, avoiding the rapids of the St. Mary's river, and is considered the water gateway of the Northwest. Mr. Fawcett, in a descriptive magazine article on the "Soo" canal, states that the Suez canal brought the wheat-fields of India and Australia closer to European consumers, but the "Soo" canal so cheapened transportation that the granaries of our nation continue to act as storehouses from which a large part of the commercial world draws its food supplies. There are two parallel locks in this canal, the largest one of sufficient size to lock four lake steamers through at once. This is the largest lock in the world, and cost the Government five millions of dollars. From 100 to 150 steamers pass through this canal every day, and its commercial value is seen when we learn that the sinking of one of the lake steamers in the St. Mary's below the canal, in the fall of 1898, suspended traffic through the canal for a few days,

* Pronounced "Soo Saint Marie."

and for this five-days delay, vesselmen estimate their loss to have been at least one million dollars. The annual tonnage passing through this canal in its eight months of navigation is greater than that which passes through the Suez Canal or enters either the port of London or New York in twelve months. Government reports show the lake craft to be as great as the whole merchandising fleet of the Atlantic, Pacific and Gulf coasts.

Then we may truthfully say that the Soo Canal, at least 1000 miles from tide-water, is the greatest ship canal in the world.

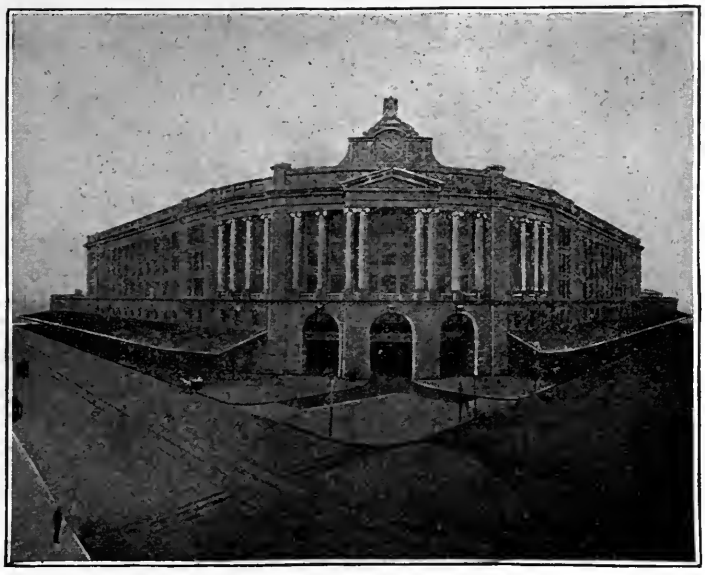
QUESTION SUMMARY.

1. Who first used canals, and for what purposes?
2. Discuss the Royal Canal of Babylon.
3. When was the Imperial Canal of China constructed?
4. What rivers does it connect?
5. How did the early Chinese change the boats from one level to another?
6. When and where were canals first introduced into Europe?
7. When was the lift-lock invented, and how did it affect canal commerce?
8. Discuss the Amsterdam ship canal.
9. What can you tell of the ship canal at Manchester?
10. Locate the Erie Canal.
11. Give some facts in reference to its construction.
12. Explain the action of a lock in helping a vessel from one level to another.
13. What city is noted for its double locks?
14. What were some important commercial effects of the Erie Canal?
15. What Scottish canal was being dug at the same time the Erie Canal was in process of construction?
16. Locate this canal.
17. Describe this canal.
18. Give some commercial facts about this canal.
19. Who planned and constructed the Suez Canal?
20. When was the canal completed?
21. Why was the channel of the canal both widened and deepened in 1886?
22. Why has this canal no locks? *Ans.*, The highest point is less than fifty feet above sea-level, and does not prevent an easy current flowing through the canal.
23. Since 1887 the canal has been lighted by electricity, and now occupies an important place as a commercial highway. Why?
24. What does it cost the average steamer to make the passage, and what time does it take? *Ans.*, $500 in gold, and requires 24 hours time to make the passage.
25. Locate the Kaiser Wilhelm or Kiel Canal.
26. Why is this canal of such value to the commerce of northern Europe?
27. What are the dimensions and length of the canal?
28. When was this canal dug?
29. What argument can you advance for Prussia's paying one-third the expense of this canal, while the German Empire controls it?
30. Locate the "Soo" canal.
31. While this canal avoids the dangerous river rapids, it has what commercial effect on transported goods?
32. What incident reveals the great importance of this canal to commerce?
33. What can you say of the locks of the "Soo"?
34. Compare the "Soo" commerce with the Suez commerce.
35. Compare "Soo" commerce with London or New York commerce.
36. What fact shows the comparative value of the merchant marine of the Great Lakes?
37. What canal is now being contemplated that will be of greater commercial value than any other canal of the world, 121 of the 170 miles of proposed canal being a natural waterway by river and lake? *Ans.*, The Nicaragua Canal.
38. What do you know of the Panama Canal?
39. Name the most important ship canals.
40. What city built on islands uses canals for streets? *Ans.*, Venice.
41. Name the "Northern Venice" of Europe. Why so called?
42. What States in our Union have a number of serviceable canals to-day? *Ans.*, New York, Pennsylvania, Ohio, Indiana, and Illinois.
43. What city, at considerable expense, dug a large drainage canal that is navigable from Lake Michigan to the Des Plaines river. *Ans.*, Chicago.
44. Has this proven of value as a highway of commerce? *Ans.*, No.

PART II.

A COMMERCIAL TRIP AROUND THE WORLD.

CONTENTS OF PART II.



South Terminal Station, Boston, Massachusetts.

A COMMERCIAL TRIP AROUND THE WORLD.

From Boston to Buffalo.

We will take a trip and try to gain a conception of the commercial world.

We start from historic Boston, the metropolis of New England. Here we see Old South Church, Faneuil Hall, Bunker Hill Monument, and old North Church, from whose belfry gleamed the signal-lights that sent Paul Revere on his famous ride. We go down to the harbor. We pass the navy yard, a place of special interest, since here are stationed "Old Ironsides," and some of the vessels which gave such a good account of themselves in the late war with Spain. Before us now lies the beautiful harbor, with its tinted waves rolling in one mad frolic to our very feet. The Government has just recently authorized the expenditure of $8,000,000 to be used in widening and deepening the channel for shipping. Here are merchant vessels for thirteen international lines. They export provisions (including animals), breadstuffs, cotton manufactures, leather manufactures, and iron and steel manufactures, in order named. They import wool and manufactures, fibers, sugar, hides and skins, cotton and manufactures, iron and steel manufactures, and leather, in order named. The total foreign tonnage in 1900 was 4½ million tons. The coast trade of Boston is greater than that of any other city of the United States. The total coast tonnage in and out for Boston in 1900 was 16½ million tons, while New York, the next largest, had 14½ million tons. The total foreign commerce carried on at the port of Boston is now over 192 million dollars, making it the second port of commerce in our nation. Its water commerce has made it the terminal of the trunk lines of the North Atlantic States. This has caused Boston to be a channel for a very heavy commerce, reaching from Chicago, Illinois, to Portland, Maine. Boston now leads all ports in the shipment of live cattle. The centering of so many railroads in Boston has led to the erection of two very large union depots. The one known as the South Terminal Station is one of the largest railroad stations in the world. The station has a total front of 3100 feet. It is fitted up with all modern conveniences, including apparatus for heating, lighting, ice-mak-

ing, air-compressing, fire-protection service, pumping-plant for disposing of water which may find its way into portions of the property situated below tide-water; and besides these, centrifugal pumps pump away any possible sewage and storm-water, which, owing to the suburban tracks, would be carried to a lower level. The storm-water of melting ice and snow from the fourteen acres of roofs of this great station are carried away by large conductors, special provision being made to keep them constantly open by suitable hot-water and steam supply.

To prevent the basements from dampness and possible leakage from tide-water, a coffer dam was built, at an expense of $75,000, and it has effectually done its work. Then, too, the lower floor is underlaid with ten layers of tarred paper, swabbed together with hot coal-tar pitch on a concrete base. The building covers 13 acres, has 32 terminal tracks, aggregating 15 miles — 4 miles of this being under roof. Nearly 750 trains arrive at and leave this station daily. The station is lighted by 235 arc and 6000 incandescent lights, and has 25 electric elevators, affording easy and ready transit from floor to floor.

We purchase a ticket to Buffalo, and enter a Boston & Albany train that is scheduled to leave this station at 2 P. M., Eastern standard time, June 28th. We soon find ourselves under way, on a road so well ballasted that there is no jar. Although we are moving at the rate of forty miles an hour, there is absolutely no dust, for the track is thoroughly sprinkled with oil; so no dust is raised by the rapid motion of the train.

Our first stop is at Worcester, 44 miles out from Boston. This city is the second city in Massachusetts; is a great manufacturing and railroad center. Its wire and iron goods, boots and shoes and Clark University have made Worcester famous. We passed 23 villages and towns in coming these forty miles, which shows us how thickly populated this State is. Each village has manufacturing plants of some kind. Probably the most noted one is Waltham, near Boston, just off to the right from the B. & A. road. Here are the works of the American Watch Co., employing 2400 workmen and turning out 2100 completed watches daily.

As we fly on our way westward we seem to see factory chimneys on every hand, which convinces us that Massachusetts is surely given the head of the column in the list of manufacturing States of our Union.

At 4:30 our train pulls into the Springfield station. Here is the home of the Springfield rifle, the seat of the U. S. Armory, where guns for army and navy are made. It is the center of large car and bicycle plants, as well as jewelry and cutlery industries. We now cross the Connecticut river, and go whirling westward. We notice the prevalence of the New England hills, and ask our seat-mate about it. He informs us that we are nearing the Hoosac range of mountains. "Will we pass through the famous tunnel?" we ask. "No," he replies; "that is on the Fitchburg Route, that runs through North Adams, about twenty-five miles north of Pittsfield, the town that is our next stop." Then we ask our Massachusetts friend about the Hoosac tunnel, and he informs us that this tunnel was first proposed in 1819, to be used as a canal tunnel through Florida mountain for a proposed Hudson river and Boston canal. In 1825 a commission selected by the Massachusetts Legislature chose the line via Fitchburg and the Miller and Deerfield rivers, with this projected tunnel through the Hoosac range. Steam roads began now to attract attention, and the canal plan was later supplanted by a plan for a railroad. The tunnel was completed in 1873, and regular trains were started through the tunnel in 1876. The tunnel is 26 feet wide and from 22 to 26 feet high, giving ample room for the double tracks that run through the tunnel. The entrances to the tunnel are granite facades, and these reveal the superior workmanship throughout the entire structure.

The central ventilating shaft is a little west of the middle of the tunnel. It is 15 x 27 feet, and extends from the top of the tunnel bore to the summit of the mountain — 1028 feet. The west shaft is 2400 feet from the west entrance, and is 318 feet to the surface of slope. The tunnel is lighted by 1250 incandescent electric lights. Thus we see the lighting and ventilating of this famous tunnel, four and three-fourths miles long, is nearly perfect. The tunnel has cost its owners 20¼ millions of dollars; part of this expense has been borne by the State of Massachusetts.

The B. & A. road now follows the valley of a small tributary stream of the Connecticut river until it reaches the Berkshire Hills, a part of the Hoosac range made famous by Whittier's "Smack in School." From the summit grade to Pittsfield is a most picturesque and delightful scenery, and we can now understand the great advantages of New England life, hills, and water-power.

At 6:08 our train makes its third stop, and we are in Pittsfield, 151 miles from Boston, and but nine miles from the "York State" line. This city was incorporated as a shire town of Berkshire county in 1761, and was named after William Pitt. It has a beautiful park in the very heart of the city. In the center of this park stands a handsome monument in memory of Pittsfield citizens who fell in the Civil War. This city has extensive manufactories in cotton and woolen goods, paper, silk, and machinery.

We now speed onward, and at 7:30 P. M. reach the capital of the Empire State — Albany, 200 miles west of Boston and 140 miles north of New York city. Our train was the Special Express, which stops only at end of divisions and makes an average of forty miles an hour. There are 66 villages, towns or cities from Boston to Albany, and 39 from Albany to New York, which gives one an idea of the density of population in this, the great manufacturing region of the nation. Let us take one manufacturing plant in this region, employing 2400 workmen. Each year these men and their families consume 8750 barrels of flour, 60,000 bushels of potatoes, 180,000 dozen eggs, 1,000,000 quarts of milk, 325,000 pounds of butter, and 1,000,000 pounds of meat, to say nothing of the sugar, coffee and tea used. Since they must also buy clothing, shoes, etc., this one factory, by furnishing the money for all these purchases, helps to support farmers, storekeepers, other factories, gives railroads freight to haul, and renders commercial assistance to very many neighbors. Thus we see manufacturing and mining New England calls upon the agricultural and cattle-raising central States for food and meat supplies, and hence the great east-and-west trunk lines of traffic, which extend the facilities for commerce of both regions.

We are now in what is known as the "Albany Gateway," through which passes the nation's commerce via the New York Central Railroad, the Erie Canal, and the historic Hudson. Besides its important location commercially, the facts that it is the capital of New York, the central city of an agricultural and dairy country, and the home of many manufacturing plants, tend to make Albany an important business town.

We here take the Lake Shore Express, one of the fast train, on the only four-track railway in the world — the New York Central. Two tracks are used for freight traffic and two tracks for passenger traffic to and from New York, its terminal point. The regular schedule for this fast train is fifty-five miles per hour, and yet we can scarcely realize that we are moving. We place a glass of water on the window-ledge, and although the glass is filled to the brim we cannot observe the spilling of a drop. We find that the "click" in passing from rail to rail is not heard, and learn that the "continuous rail" that is used over the 10,000 miles of this system entirely removes this unpleasant sound. But look! we are now flying through one of the oldest towns in the State — Schenectady, a village that was sacked and burned by the In-

"Rounding the Nose," New York Central Railroad, Mohawk Valley, New York.

dians and its inhabitants massacred in a midnight attack in 1690. To-day it is a most interesting place. Here are located the Schenectady Locomotive Works, the second largest locomotive works in the world, employing 2650 men. Here also we find the General Electric Company, which is one of the greatest manufacturers of electric appliances in the world. It employs 7200 men and its weekly pay-roll exceeds $80,000. Besides these two great plants are numerous other manufacturing establishments, that make this city a very busy place.

We are now on one of our nation's greatest arteries of commerce, that traverses one of the most beautiful valleys in our nation. Dr. Talmage, a world-traveler, says, "The most beautiful sight I ever witnessed was along the Mohawk Valley."

Our next stop is at Utica, 95 miles west of Albany. This city is situated at the most favored spot in the Mohawk Valley, at the junction of the Erie and Chenango canals, and is a great railroad center. Its manufacturing plants annually turn out more than ten million dollars' worth, and thousands of pounds of New York cream cheese are sent from its agricultural district. The city was developed by the Erie Canal, and within the business part of the city is the site of old Fort Schuyler of Revolutionary fame.

We are now entering the great lake and fruit region of "York State." The importance of the farms in this region leads to the study of the State's farm products, and we find that Illinois is the only State that surpasses New York in the value of her farm products, while this State ranks first in buckwheat, hops, milk, butter, and cheese.

As we leave the valley of the Mohawk for the "Lake Divide," we decide that this view — "rounding the nose in the Mohawk Valley" —is the most striking of the many charming views that the bright moonlight of the evening has revealed to us. After an hour's delightful ride through this rich farming region we reach our second stop — Syracuse, almost half-way between Albany and Buffalo. This city is on a creek of the same name, at the head of Onondaga lake. Here is located the State armory, and just outside the corporation stands the State School for the Feeble-Minded,— a beautiful structure in the Italian style of architecture. Syracuse is a great railroad center, with ten important railroads. The Erie Canal passes through the city, and has been an important factor in its growth. Syracuse is known far and wide for its salt. The salt springs were first visited by the Jesuits in 1787, when a white settlement was established and began the manufacture of salt. This is now one of the lesser industries of the city, as the city turns out over 25 million dollars' worth of manufactured articles annually. Very extensive iron and steel works, sash, door, blind, table and other furniture factories, factories of musical instruments, glass, matches, agricultural implements, ready-made clothing, are seen in this city of over 100,000 population.

As our train continues its westward journey we are impressed with the train after train of heavy freight we see traveling eastward. After a sudden start caused by the quick passage of an east-

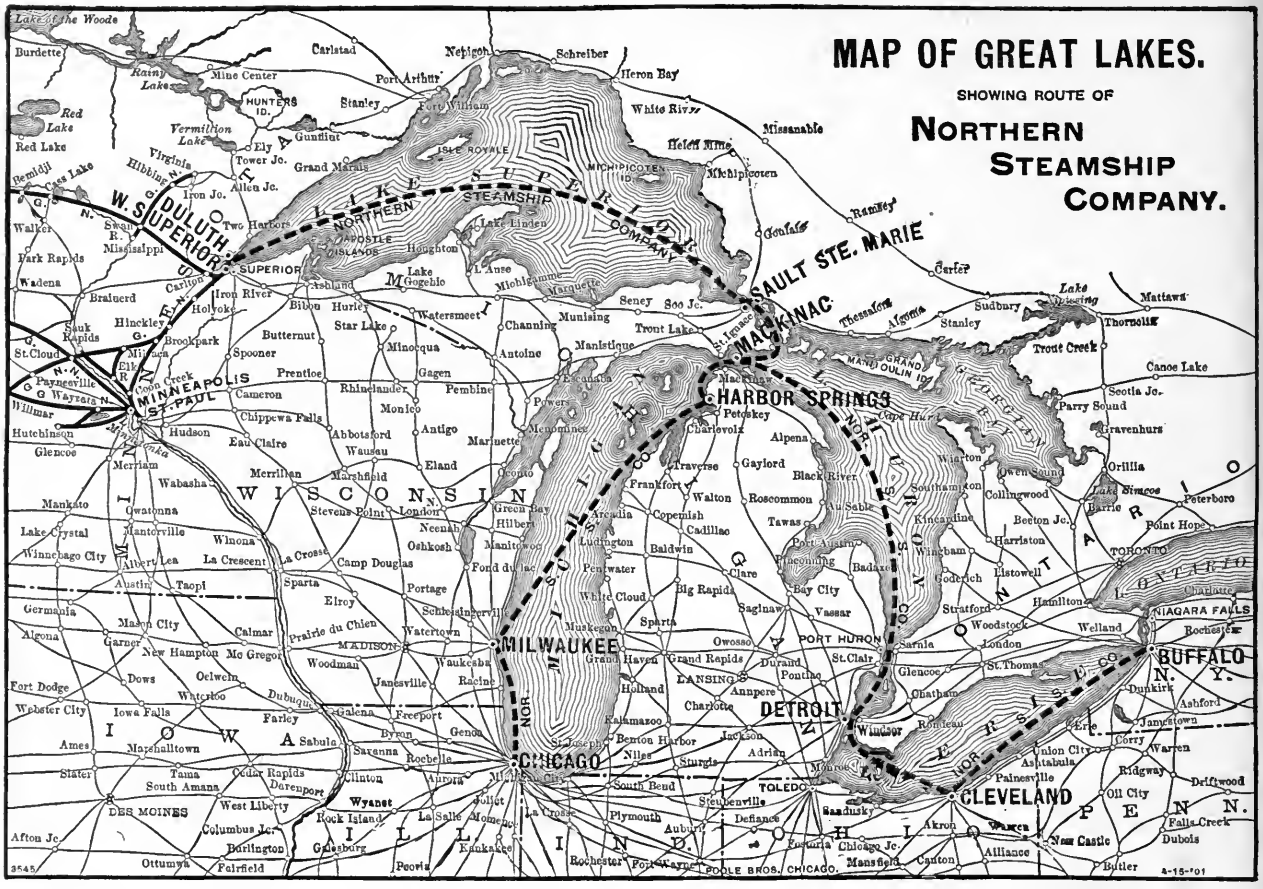
bound flyer, we venture to question the nearest neighbor about the freight traffic of the New York Central. This man, affable and courteous, was an early settler. He told us that he lived in this region when it took a week to travel from Albany to Buffalo. He has seen the development of this road we are riding on, from one track to the six parallel tracks that now stretch from Albany to Buffalo. Said he: "The Erie Canal was a great thing for us and for the State, and to-day it transports annually three and one-half million tons of freight. But it has several competitors in the 87 railroads that are now in York State, some five or six being active competitors of the canal for Buffalo freight." "To-day it is no uncommon sight to see a New York Central freight engine pull 75 grain cars, each holding 1000 bushels, aggregating the average product of 3750 acres of wheat. That train that we are now passing is a long one, and probably has 85 to 90 cars of wheat." "During the busy season our folks have counted from 75 to 100 daily trains of through freight. I am told that the freight carried over those four tracks yonder amounts to 25¼ million tons in a year." "The strangest thing about the whole business," said the New-Yorker, "is that the New York Central now carries a bushel of oats from Buffalo to New York (450 miles) as cheaply as Uncle Sam carries a letter between the same points. This, I am told, includes Buffalo elevator and New York lighterage charges."

Thanking our New York friend for his kindness, we now studied the landscape, which was a constantly changing panorama, with villages, green fields, dark woods, and silvery water beautifully intermingled.

At 1:15 A. M. we reach Rochester, the "Flower City" of our nation. This city clearly illustrates the effect of commercial connection with the world of commerce. In 1822 this city is said to have been a village of half a hundred: through its transportation facilities it has grown to be a city of 170,000. Rochester is situated in the rich Genesee valley, and lies on both banks of the Genesee river. Within the city are three falls, one being 96 feet and affords fine water-power. Before the development of the great wheat region of the Northwest, this was the "Flour City" of the nation. Although it still has 17 flourishing flouring-mills, it has passed the sobriquet on to its big successor of the Northwest. Here we see the fine aqueduct that conveys the water of the Erie Canal over the river. This aqueduct is 848 feet long, 45 feet wide, and consists of 10 arches. Here originated the kodak camera, and $5,000,000 is now invested in the kodak business at this point. Rochester has a magnificent system of water-works, the Holly system, that pumps the water for city use through 262 miles of mains. Here are located the largest carriage-works in the United States, besides more than a thousand other manufacturing plants, turning out an annual product valued at more than 66 millions of dollars. But the great industry is the flower industry, hundreds of acres surrounding the town-site being entirely given over to the raising of flowers.

The Rochester University and a theological seminary were established in 1850, and have grown to be strong and important educational attractions for the town. The rapid growth of the city is largely due to its immense water-power, the facilities for transportation, and the remarkable fertility of the surrounding country, being but seven miles from Lake Ontario and in the great vine and nursery region of New York.

We now leave the canal, our almost constant companion from Albany, and, turning southwest, have a delightful run across the richest farming region of the State. We reach the city of Pan-American fame at 3:10 A. M. Eastern standard time. We have been but seven hours, including all stops, in traveling from Albany to Buffalo, a distance of 300 miles. September 14, 1891, the Empire State Express, drawn by the famous locomo-



tive No. 999, made an experimental run from New York to Buffalo, making a 436½-mile run in 425¼ minutes — the fastest time on record. This express, the pride of all New York, makes its regular daily run between these cities at an average schedule speed of 53½ miles per hour, including four stops, two of them to change engines, and twenty-eight slow-downs through incorporated cities. The regular schedule time on parts of the line is 64.8 miles per hour. (See cuts of the first steam railway train in the State, and the "Empire State Express," the fastest regular train in the world, on page 27.)

Let us spend a day at the Pan-American Exposition and Niagara Falls, before we take our lake ride to Duluth.

We entered Buffalo during the period of the Pan-American Exposition, which was destined to bring the three Americas into closer social and commercial relations, and thus promote the well-being of the Western continents.

Buffalo, in the vicinity of Niagara Falls and within a day's communication of forty million people, convinced Congress and the nation at large that she offered peculiar advantages for the exposition that was to illustrate the development of the Western World in the arts, industries, manufactures, and show the products of the soil, the mine, and the sea. The "Rainbow City" is a memorial to Buffalo enterprise, industry and capital. The color effects, electrical features and the object lesson of the vast resources of North, Central and

South America was a surprise and delight to the thousands who came from all lands. Many were surprised to find Buffalo a city of almost 400,000 people, the home of more than 3000 great factories — one-twelfth the manufacturing establishments of the nation. Buffalo was seen to be a great railway center, with her 26 lines of railway, having a passenger service of 250 trains daily and an immense freight traffic. It is the fourth commercial port of the world, with 12 steamer lines, representing an annual tonnage of five million tons, being the eastern gateway of the great lake trade. It is reported to be an exchange point for more trade and traffic than any other place in the world. Buffalo has the finest system of interurban trolley railways of any American city.

The great Northwestern elevator is the largest in the world, and with its numerous companions receives and distributes annually 200 million bushels of grain. Besides this, Buffalo handles 670 thousand tons of miscellaneous freight from her lake trade alone.

In 1886 citizens of Buffalo offered $100,000 to the genius who would devise means of harnessing Niagara's power. Ten years afterward this engineering wonder was accomplished, and to-day the factories of not only Buffalo but many other cities within a radius of profitable transmission are worked by the mechanical or electric energy from the small fraction of Niagara's power that has now been harnessed — 450,000 horse-power. All the machinery of the Pan-American Exposition, the street-cars, the electric-lighting system, the scores of mills and hundreds of factories of Buffalo in 1901 were supplied their energy in units of 5000 horse-power each, transmitted over copper cables of 19 wires each.

A Lake Ride from Buffalo to Duluth.

But, wearied of sights and wonders, we see the spacious harbor and easily select the pride of the lakes — the steamer "Northwest." This is the one that is to take us on the longest lake ride in the world, and we therefore study it with interest as we ascend the gang-plank and proceed on deck. This is one of two steamers that were built by the Globe Iron Works of Cleveland, Ohio, expressly for passenger service. It impresses us as a veritable floating palace as we stand on a promenade deck more than one-eighth of a mile long. Through the kindness of a ship's officer we gain a conception of the size of this creation of steel. "The Northwest is 386 feet long, 44 feet wide, and 34 feet deep," he says. "Its hull is built of steel throughout, the interior being especially constructed to meet the necessary requirements of the 28 Belleville patent water tube boilers with their two quadruple expansive 3500-horse-power engines which are placed amidship, with coal-bunkers extending longitudinally through the different boiler spaces, capable of holding 1000 tons of coal. The lower deck forward is fitted for emigrant passengers, and the after deck as a baggage-room and crew quarters. Between the two, amidship, is the electric engine and dynamo-room, 120,000 feet of wire being used throughout the boat, furnishing fifteen hundred sixteen-candle-power lights and an electric signal-light of 100,000 candle-power.

"A refrigerator plant is also used on the steamer, cooling all compartments carrying perishable provisions. The plant is arranged to manufacture 1000 pounds of ice per day for use on shipboard. On the main deck you find our dining-room, seating 150 guests. Please observe that the woodwork is finished in white mahogany, and that the furniture has been especially designed and made for this boat. Come with me up the grand staircase to the spar deck and see the grand saloon, which clearly illustrates the 'rococo' style of decorations employed throughout the boat. On the hurricane deck are our staterooms. Those forward are furnished with full-sized bedsteads and all modern conveniences. Here we have accommodations for 544 passengers."

"What was the cost of this steamer?" we ask. "Over one and one-half millions of dollars," we are told. "What is her speed?" "Twenty knots an hour." "What is her crew?" "One hundred and eighty-five as true sailors of water as salts from the sea," answered the officer. And now we notice that preparations for the voyage are actively in progress. Promptly at 10:15 P. M. we move out from the dock, pass the tall elevators, and with our searchlight lakeward our voyage is begun.

As we pass out of the harbor the beautifully illuminated electric tower on the Pan-American grounds stands out boldly, with the night for its background. Its flashlight, more than 400 feet from the ground, illuminates the grounds, and its searchlight is the great "magic lantern of Wonderland." That tower with its 40,000 radiant lights gave the name "Electric City" to the Exposition grounds. The lights of the city, added to those used at the Pan-American grounds, made a sum total of 500,000, the power for their illumination being a very small fraction of the energy of Niagara, "twenty miles away."

As we gaze upon that beautiful sight, a city of stars, with playing fountains of flashing diamonds, we are reminded of Secretary of State Hay's apt remarks, June 13th, 1901: "Last night as I looked from my window at this marvelous creation lined in fire upon the evening sky, and to-day as I have walked through the courts and the palaces of this incomparable exhibition, the words of the prophet have been constantly in my mind: 'Your old men shall dream dreams; your young men shall see visions.' It was noble and inspiring, leading to earnest and uplifting labor. This ideal of the brotherhood of nations of the Western World is not a growth of yesterday. It was heralded when the country was young, by the clarion voice of Henry Clay; it was cherished by Seward and Evarts, Douglas and Blaine. Out of a good source evil cannot flow; out of the light darkness cannot be born. The benignant influences that shall emanate from this festival of peace shall not be bounded by oceans nor by continents."

The 175 miles from Buffalo to Cleveland is measured in seven hours. We pass the lighthouse, that used to have the upper and lower lights. On stormy nights, unless the lower lights were burning ships seeking entrance to the harbor were liable to be cast upon the rocks and wrecked. One very stormy night the lower lights went out, and a large steamer was wrecked. That incident led P. P. Bliss to write the beautiful song, "Let the Lower Lights be Burning." We observe that the lighthouse has been cut down, and has no upper lights at present. We pass the breakwater, and enter a beautiful harbor inclosing two miles of waterfront. Besides the lake port, Cleveland has the Cuyahoga river frontage of sixteen miles, five of which are docked. Here is located the largest drydock on the lakes, built in 1891. It rests on 2000 piles, surrounded by a five-foot wall of puddle, costing in all $200,000. We find Cleveland to be the leading shipbuilding city of our nation, second only to the Scotch city of Clyde, the most extensive shipbuilder in the world. Her lake commerce exceeds 275,000 tons, the largest single item being iron ore.

Here is the home of the Standard Oil Co., where until recently more petroleum was refined than at any other place in the commercial world. Cleveland also leads the world in sewing-machine manufacture, while her heavy iron castings, bridges, trusses, nails and tacks are well-known articles of trade. Her 2500 manufactories employ more than 50,000 workmen. Her more than thirty banks are so economically and prudently administered that she has not had a bank failure for over eighty years.

Her Euclid avenue marks the highest type of beautiful and well-lawned streets, and her Garfield Memorial is the observatory of one of the most beautiful cemeteries of the nation, as well as the greatest tribute of the nation to a beloved though martyred son of Ohio.

Moses Cleveland, in July, 1796, sailed up the lake-shore to the mouth of the Cuyahoga with a company of forty-eight men and two women. Viewing the landscape from the plateau near the lake, Mr. Cleveland exclaimed, "This is destined to be the site of a great town and the future gateway to the great West and South." To-day it is the handsomest of all the lake cities, with more than 380,000 people, the largest city in the Buckeye State.

Cargo and mail exchanged, we leave Cleveland harbor, to enter, in a few hours, Lake Erie's most famous summer resort — Put-in Bay. This marks a group of small islands about sixty miles northwest of Cleveland; one island — Put-in Bay — having a small but excellent harbor. Just off the northwest corner of this island occurred the famous naval battle of Lake Erie, where Commodore Oliver H. Perry met the British fleet in 1813, and told the story of the battle in the laconic message to the President, "We have met the enemy and they are ours." Some of the brave sailors who lost their lives in the great battle, sleep beneath the Napoleonic willow that marks their grave on the northwest plat of the island.

Now we are "at sea" again, and with large appetites sit down to luncheon in the dining-room. Out of sight of land, yet in the middle of a great continent. Racing through the waters at a speed of more than twenty-five miles an hour, yet moving so steadily that our coffee does not spill nor the lemon custard lose its form. Words cannot describe that meal, but its last course is just completed when "land" is called, and on reaching deck we find our ship nearing the Canadian shores at the extreme western end of the lake. "What! do we not stop at Sandusky or Toledo?" "No, we cannot make all lake cities in this line, which is scheduled, and is the 'Fast Flyer' of the lakes," said a ship's officer in passing. Asking him about Toledo, he told us that Toledo had one of the best harbors on the lakes. It does the greatest business in soft coal and clover seed of any lake city. It has large manufacturing industries, while the "Woolson Spice Co." is a household word all over the country. Toledo has about 135,000 inhabitants, and has a great railroad commerce.

We now enter the Detroit river and the scenic part of our route begins, for from the lighthouse at the entrance of the river until we pass Mackinac there is not a mile that we do not want to "kodak." Simultaneously, Windsor (Canada) and Detroit are revealed by a bend in the river. These two cities are separated only by the river, about a mile apart, yet commerce is subject to inspection by Government officials that pass between them, for everything must "pass" by custom-house regulation.

We reach Detroit (French for "The Strait") at 4 P. M., and spend thirty minutes in port. While waiting here we go up where we can see Belle Island, whose horticultural beauty shows the skill of that prince of landscape gardeners, Mr. F. L. Olmstead, the artist who planned the landscape vistas of the Columbian Fair Grounds at Chicago in 1893. We next take a "bird's-eye view" of the only marine postoffice in the world.

The tonnage passing Detroit in a season of eight months is more than that received in London, the greatest port on the globe, in twelve months. It is even more than the tonnage received at New York added to that received at Liverpool. Seven-eighths of this tonnage is carried in the holds of "through freighters" that do not touch at Detroit either going or coming. On an average there is a vessel passing the port every four minutes of the day during the lake season of eight months. To serve these interests, Uncle Sam has established a marine postoffice.

The tug "Florence B." has three carriers, who classify by lines and boats the mail received from the clerks of the marine office. These carriers work in shifts of eight hours each, and, we are told, so efficient is the work done in this marine office that owners of steamers rely upon it for delivery of

orders to their captains and crews, and their families are brought in as close communication as though connected by the best of railroad mail lines.

The home of Tecumseh, an historic Indian of "bellum" days, is pointed out to us on Peche Island. Many of these islands, so promiscuously scattered through the river, have costly houses where wealthy Detroiters spend their summer hours.

We now notice that Detroit has a nine-mile water frontage, and learn that her lake trade aggregates 235,000 tons. We learn that Detroit is a most delightful city of nearly 290,000 people, but do not have time to go "up town." As we leave port we get a beautiful panoramic view of the city. It contains many costly buildings, and has such a good slope that its drainage is well-nigh perfect, and with a large river having a good current washing its shores, sanitation is remarkably good.

We round the headland of Belle Island, where is located a rugged stone Government lighthouse, and enter the waters of Lake St. Clair.

Just at sunset we reach the Government Ship Canal, at the mouth of the St. Clair river. This canal was built by the U. S. Government, at an expense of $650,000. It is 8200 feet long, 200 feet wide, and 16 feet deep.

As the electric lights are turned on, let us go to the library and get an estimate of the Great Lake commerce. We find there the Government treasury reports for 1900, and from these learn that 37 of the main ports show an aggregate of 1,266,000 tons of flour, 53,000,000 bushels of wheat, 71,000,000 of corn, 33,000,000 of oats, 13,000,000 bushels of barley and rye, nearly 20,000,000 tons of iron ore, 2,000,000 tons of coal, 2,000,000 feet of lumber, with three and one-half million tons of unclassified or miscellaneous trade. The freighters that are largely used for this work are built especially for the lake trade, and are termed "whalebacks" from their peculiar shape as shown by the cut on page 87. Many of these "whalebacks" with their barges haul enough down-stream to fill thirty freight trains of thirty-five cars each.

As it is now bright moonlight, we again seek the deck, to study that most peculiar river, not more than thirty miles long, that has a mightier commerce than the great "Father of Waters," and yet has so many islands that each one of us is tempted to be a Robinson Crusoe and have an island all to one's self. In the language of another, we give a word-picture of these remarkable St. Clair Flats: "Passing into the entrance of St. Clair river, which is a vast expanse of marshland and clear running water, full of deep and winding channels, the boat enters the famous St. Clair Flats. These consist of thousands of acres of partly submerged land, the curious topography of which is a source of constant wonder and delight to the 'landlubber.' Here nature has blended the beauties of river, lake, meadow-land and trees into a picture of indescribable loveliness. Instead of being a stagnant marsh, full of green slime and disagreeable odors, the waters flow clear as crystal over a sweet-smelling meadow-land, offering a paradise for those who seek piscatorial delights, or love to hear the musical dip of the oars as the rowboat glides over the streets of watery blue that beautify this lovely little Venice."

As we approach the source of the river strait, we see the tall spires and silent columns of Port Huron on the one side and quaint old Sarnia on the other. Here is located one of the most remarkable tunnels yet projected — the St. Clair tunnel. For a number of years ferry-boats transported the trains of the Grand Trunk Railroad across the river at this point. This at any time was expensive, but in the winter, with the river filled with floating ice and a current of six to eight miles an hour, it becomes ofttimes a hazardous undertaking; and even in summer the time consumed in crossing the river often broke the train's schedule. Then it was decided to tunnel under the river. Operations were begun simultaneously on both sides of

the river. The river is here from one-half to three-quarters of a mile wide, and forty feet deep. Fifteen feet was allowed for a "roof," and steel tubes called "shields" were driven through the blue clay below the roof. In these shields the men worked, and on August 30th, 1890, the shields from the Canadian shore met those from the United States shore in the middle of the river, and the chief engineer had completed his remarkable work in one year's time, surmounted obstacles that at times threatened utter defeat of his plans, when, in spite of all he could do, it seemed as if the tunnel would be flooded. But the air-compressor sent in an added pressure of air, often running up to forty pounds per square inch, holding back the water until the shield was forced through the gravel or loose sand pocket that contained the water, into the blue clay beyond. This remarkable tunnel is 6000 feet long, and by the electric light its night is turned to day.

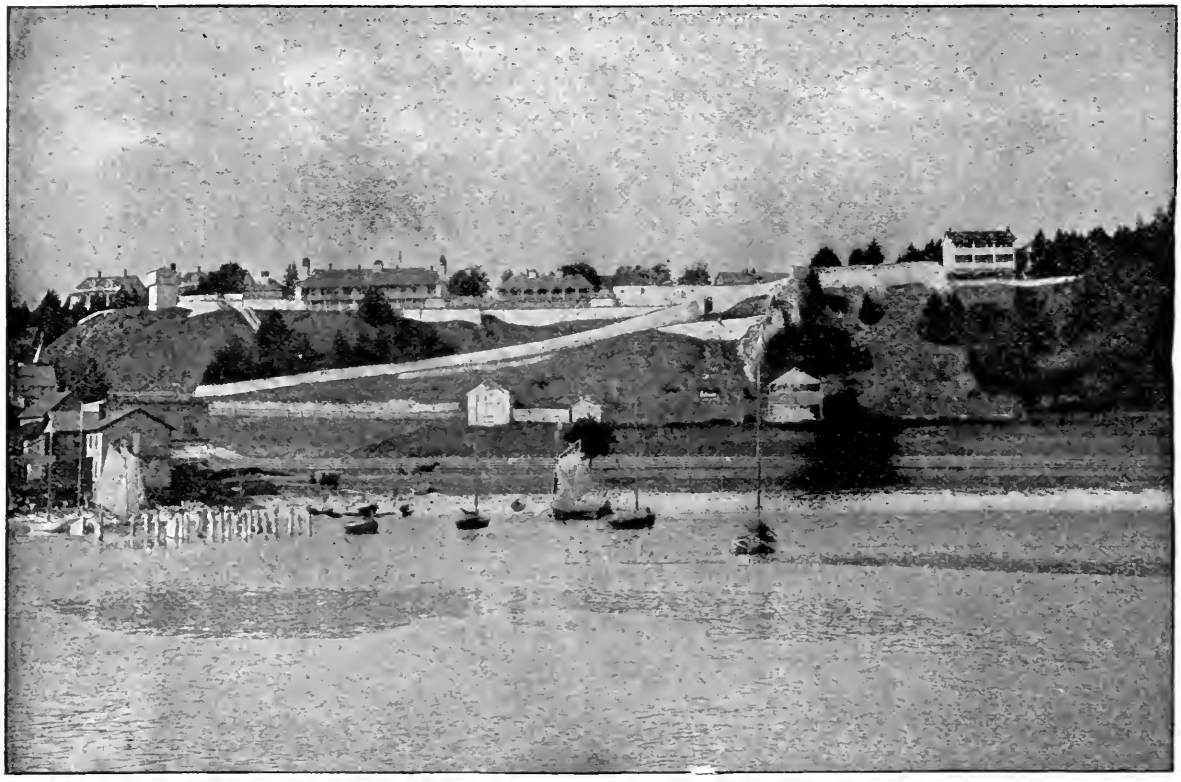
We pass grim Fort Gratiot, and are soon steaming through the moonlit waters of Lake Huron. Next to shallow Lake Erie (only 200 feet deep), Huron has had the most furious storms and wrecked more ships than any other of the Great Lakes. It is over 800 feet deep and more than 240 miles long. On its eastern shore is a wide extension known as Georgian bay, and half-way up the United States shore is Saginaw bay, fully 15 miles wide and 40 miles long, with Bay City and Saginaw cities at its head. The Saginaw river is 18 miles long, and on its banks have been produced eighteen billion feet of pine boards. While in the middle of Lake Huron with a water-bounded sky we saw the king of day rise up from his water bath. Oh, that sunrise on the water! To fully comprehend it, one must see it; words prove inadequate for a just conception.

Just before noon we come to the meeting of the ways, the boats from Lakes Superior and Michigan entering the same channel on their way to the far East. We deflect from the direct course to touch at Mackinac Island, rich with early continental history, alternating as it did between Indian, French, English and American possession. Here LaSalle hunted, fished, and traded with the Indians; while Joliet, Marquette and Champlain legends make this a center of Northwestern history and romance. As our boat stops here for one hour and fifteen minutes, we will take an inventory of some few of the many delights, to the globe-trotter, found on this island of green hills and typical French landscape.

Yonder, commanding the rounded harbor, is that old fort, now crumbling to decay with the neglect of peace. Here, high up on the pine-clad bluff that commands a fine lake view, is the Grand Hotel, where most of our passengers are indulging in a clam-bake. Along the hillsides, even to the very water's edge, we see scores of cozy summer cottages built for comfort rather than style, — for here is the Mecca where many spend their "halcyon days" in rest and recuperation. Up there on the eastern side of that limestone cliff is Arched Rock, a natural bridge 145 feet high and 40 feet wide.

Then we go down to a place where the British landed in 1812, take a peep at the Fairy Arch, Devil's Kitchen, Lover's Leap, Chimney Rock, Pontiac's Lookout, Scott's Cave, and stroll through the beautiful grounds of the many hotels and cafés found here. Mackinac is the field elysian to the disciple of Izaak Walton, and as a summer resort ranks second only to Harbor Springs, the greatest one in this Great Lake region.

As we return to the boat we see that more than half our number have transferred for passage to Chicago, the famous metropolis of the interior and second city of our Union. We notice a cool summer breeze, and find that our thermometer registers but 60 degrees,— most delightful weather for midsummer. We learn that the average temperature for June at Mackinac is less than 59°; July, 64°; August, 62°; September, 56° to 57°.



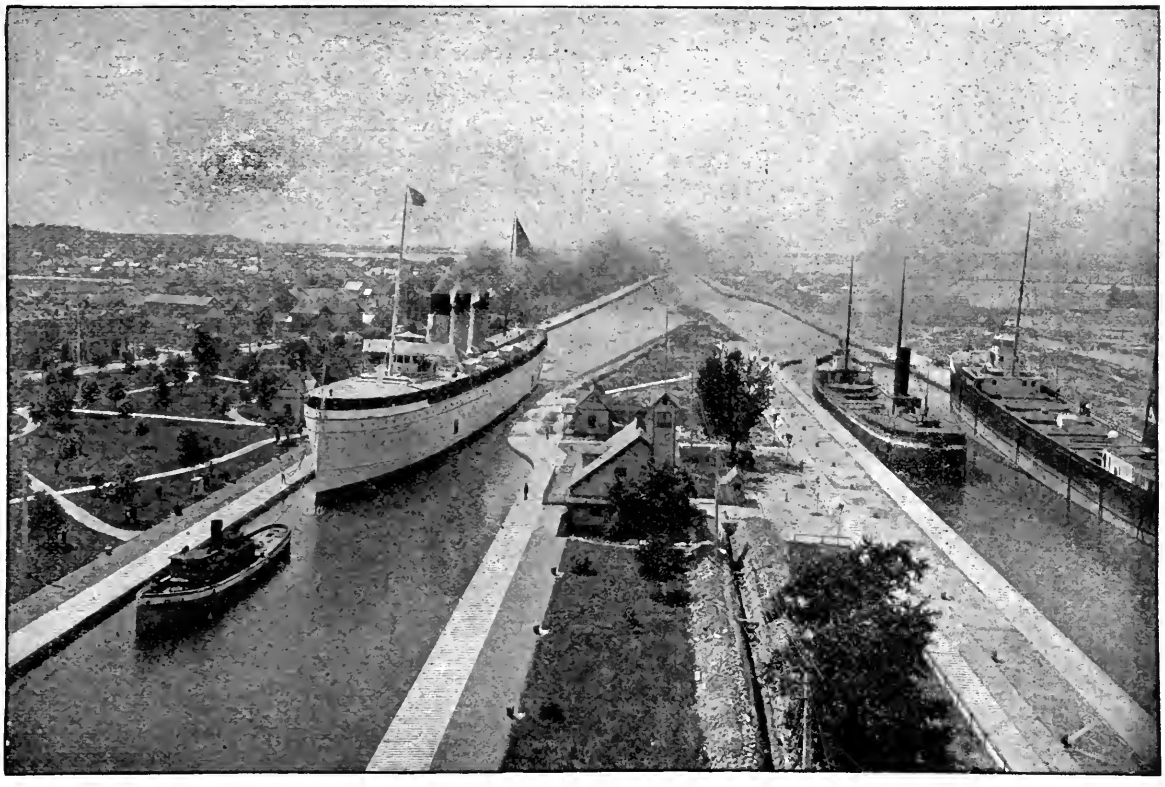
Mackinac Island—Old Fort.

At 12:45 P. M. we continue our journey, for we are 588 miles from Buffalo. Soon we enter the St. Mary's river, with its 5000 emerald isles and lake-like enlargements all along its length of sixty-two miles, fringed by high protecting walls of hills. We pass by an island that reminds us of "Jam" Island that we visited in Lake Huron, where more raspberry jam is produced than in any other place in the nation. The Indians pick the berries, and jam is made by thousands of gallons every year.

We observe tents alongshore and an occasional motionless and seemingly unoccupied rowboat as we pass along. We also observe that our boat is moving along very leisurely. On inquiring we find that Government watchers are in the tents and rowboats. It is their business to see that no steamer passes through this river at a speed of more than twenty-one miles per hour. Should they report a greater speed than that, owners of the vessel are required to pay a five-hundred-dollar fine. The peculiar nature of navigation in the river renders this precaution necessary, and these Government watchers have learned to spy out from inconspicuous places every passing vessel of more than two thousand five hundred tons burden. No vessel can easily elude their vigilance, and the Government enforces its penalty without "fear or favor."

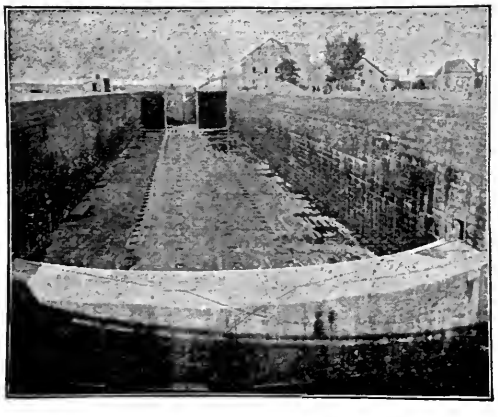
Just before eight o'clock in the evening we reach Sault Ste. Marie. On account of the rapids in the St. Mary's at this point, the river is not navigable. To obviate this, the Government at a great cost built the Sault Ste. Marie Canal (popularly called the "Soo" Canal) from this city to the lake, a distance of three miles.

Our vessel with three others was "entered" at the new lock, the rear gates shut, and the water



Entering the Lock, "Soo" Canal.

let in. In a very short time we gradually rose to the level of Lake Superior — eighteen feet — and the front gates were cleared for us to "toll out." This lock was opened by the United States Government August 3, 1896. It took nine years to build it, and it cost five millions of dollars. The lock is 100 feet wide, and is twenty-one feet deeper than the level of the river. As we see, it is long enough to "lock" four large lake steamers through at once.



Canal Lock Empty, "Soo" Canal.

The "Soo" has three large locks — two opened by the United States Government, and one built by the Canadian Government. The latter is 900 feet long, 60 feet wide, and $26\frac{3}{4}$ feet deep.

As we pass slowly up the ship canal we can but think of the effect of this commercial improvement on the Northwest country. In the early days this was the gateway of the fur trade, but to-day a commercial fleet of more than 4000 steam and sail vessels passes through this gateway with nearly $240,000,000 of the nation's varied commerce, and navigates these great inland seas, containing one-third of the fresh water of the globe.

And what is the cost? Official reports of late years reveal the fact that lake freight is being transported at an average cost of three-quarters of a mill per ton per mile, while the very lowest charge by rail that we can obtain is three mills per ton per mile. Although millions of dollars have already been spent, even greater expenditures are planned to make the commercial service of these natural highways still more remunerative and effective.

Now we are upon Superior, the greatest body of fresh water known to man. It covers more territory than the States of Delaware, Rhode Island, Massachusetts, New Jersey, and Vermont, with the District of Columbia and our island possessions of Wake, Guam and Tutuila thrown in for good measure. This lake, more than a thousand feet deep, is fed by thousands of cold springs, that make the water even in midsummer so cool that overcoats and other winter wraps are none too heavy for deck promenades.

Look at those receding shores! The moonlight reveals the regular layers of rock that are so smooth and straight that one would think them the parts of some carefully laid wall. We are told that it is nature's own handiwork, and that passengers who return view these scenes by daylight. They report this the beginning of those miles and miles of pictured rocks that show remarkable colors in the sunlight. The southern shores of this lake give to Michigan her wealth of copper, coal, and iron. Here is mined one-third of the copper of our nation, the richest copper region of the world; while the iron beds of Superior are well-nigh inexhaustible.

A little before noon we pass this busy port on Keweenaw peninsula called Copper Harbor. Here, we learn, is one of the greatest copper ports in our land.

Now we are water-bounded on the bosom of this mighty inland sea. The "Northwest" is showing herself a speedy vessel, making her top-rate speed. Seated in our steamer-chair on the hurricane deck, in a place that shelters us from the lake breeze yet gives a commanding view to the left and right, with a good ship's orchestra giving life and pleasure to all on shipboard, with neither dust nor heat to detract or annoy,— surely, this is the acme of travel and this the crowning pleasure of a most delightful voyage.

Time forbids telling of the historic and remarkable islands passed on the way, although the Apostle group have a very interesting and historic past. Surely, this is well named by the Ojibways, "Gitchee Gumee"—the Big Sea Water.

Sunset on Lake Superior can be painted but not described. Have you ever stood before a mighty but silent power and felt its energy thrill your soul? Did you ever gaze upon a picture that was so beautiful, so impressive, that language forsook you, and then you would stand speechless, with eyes bringing to the soul the indescribable beauty that the artist had made so realistic? Then you may know that, as the sun slowly sinks to his rest and stops to admire the roseate beauty of his own tinted clouds and the flashing jewels of Superior's rippling waters, the true lover of nature is impressed by the depth of color that darkens in the waning light, and feels the weight of the mighty expanse of water whose gloom is forced in upon his very soul by the slowly deepening twilight shadows.

Mighty as our 5000-ton passenger steamer may seem, when that "Big Sea Water" shows his now hidden force our steamer will be a pigmy in the power of a Samson whose strength has never yet been measured, whose power is infinite, whose energy man can never compute.

What is that which we see gleaming far over the waters? We are told this is the Two Harbor Light. Just then our ship's great searchlight is brought to bear on the lighthouse, and we see that it is a square brick tower 78 feet high, rising from the southwest corner of the keeper's house, a two-

story brick dwelling This marks the headland of Burlington bay, and is fully sixteen miles away.

Later we see straight ahead a deep red light shining steady and strong, with a flashing red light that intermits every six seconds. Soon we learn that these are the Duluth harbor lights, that are signaled by our vessel's signal light. The fixed red light is a forty-foot light, on a square, brown pyramid, open framework tower that marks the outer end of the south pier, the entrance to Duluth harbor. The flashing red light is the forty-six-foot light that stands on a frame tower on the inner end of the same pier. The pilot carefully directs the steamer to her place at the dock, the gang-plank is let down, and we enter the "Zenith City of the unsalted seas" — Duluth, 1066 miles from Buffalo.

Loading the Great Whaleback Boat at the famous Grain Elevators, Chicago, U.S.A.

We started from the last-named city Tuesday, at 10:15 P. M., and we entered Duluth at 10:30 P. M. the following Friday.

We find Duluth such an interesting commercial city that here we spend several days. The city is situated at the junction of the rail and lake trade and is one of the great commercial centers of the Northwest that cleans, stores and ships grain from "the world's great bread-basket." On the lake-shore we find great docks running out into the lake from two to four thousand feet, from 50 to 75 feet high and 50 to 60 feet wide. Looking across to Duluth's sister city, Superior, we see that great ore dock where 20,000 tons of ore is daily loaded in the freighters of the lake. Duluth, Two Harbors, Ashland, Gladstone, Superior and Escanaba are the great shipping points for iron ore. The freighters transport this ore (in 1901 it amounted to twenty million tons) to Conneaut, Cleveland, Ashtabula, Lorain and Fairport on Lake Erie, and South Chicago on Lake Michigan. We are surprised to see how the "gravity dumps" load vessels at the rate of scores of tons per hour, but we are told that by bridge tramways and trolley" vessels at the ports of Chicago and Cleveland one may see 50,000 tons unloaded or stored in a single day. There being little or no coal in this region, it is found that it is much cheaper to transport the ore to the coal to smelt, than it would be to bring the coal to the ore. This in a measure explains why the great coal center of Pittsburg has become the great iron and steel center of our nation.

The view from the docks looking up the streets of Duluth is very impressive, as the city is situ-

ated on a side-hill facing the lake. Thus we gain a panorama of our great grain and ore port that has been brought into existence by our Northwest commerce. In 1873 this city had a population of only 3000; to-day it has more than twenty times that number. Less than 150 miles southwest of this city are the twin cities of Minneapolis and St. Paul. These two cities form one of the ten great commercial and manufacturing centers of our nation. Lying as they do, near the headwaters of the navigation of the Mississippi, in the vicinity of St. Anthony's Falls (a great source of mechanical power to-day), with the vast grain belt of the Northwest at their very doors, they are destined to enjoy great commercial advantages. The Pillsbury Mills are famous, and grind out daily 25,000 barrels of flour. The annual output of all the mills of Minneapolis is approximately 15½ million barrels, thirty per cent. of which is exported. Nearly 400,000 tons of feed is also produced in these mills. The exported products, if laid in a line, would reach from New York to Denver, and if the entire output were placed in line it would reach from New York to Honolulu. If loaded on cars, it would make a solid train of freight cars 1620 miles long. Truly, then, Minneapolis may be called the "flour city" of our nation and of the world. Minnesota makes over 118,000 barrels of flour daily, sending much of it to the newly developed fields of South Africa and the Orient, as well as to England and Turkey. All the world's mills are supposed to grind out on an average 361 million barrels of wheaten flour annually, to support the more than 510 millions of bread-eaters. The amount of lumber shipped from St. Paul and rafted down the river makes it one of the great lumber centers of our Union.

Now we leave the Duluth docks and pass the great mill, that has a storage capacity of 650,000 bushels and grinds annually 6,750,000 bushels of wheat into 1,500,000 barrels of flour. Yes, Duluth has one of the three greatest mills in the world. If the annual product of this one mill were placed on cars, it would make 321 full freight trains.

We now pass in full view of its beautiful high-school building, a testimonial of the educational interests of the city, and built at a cost of $400,000.

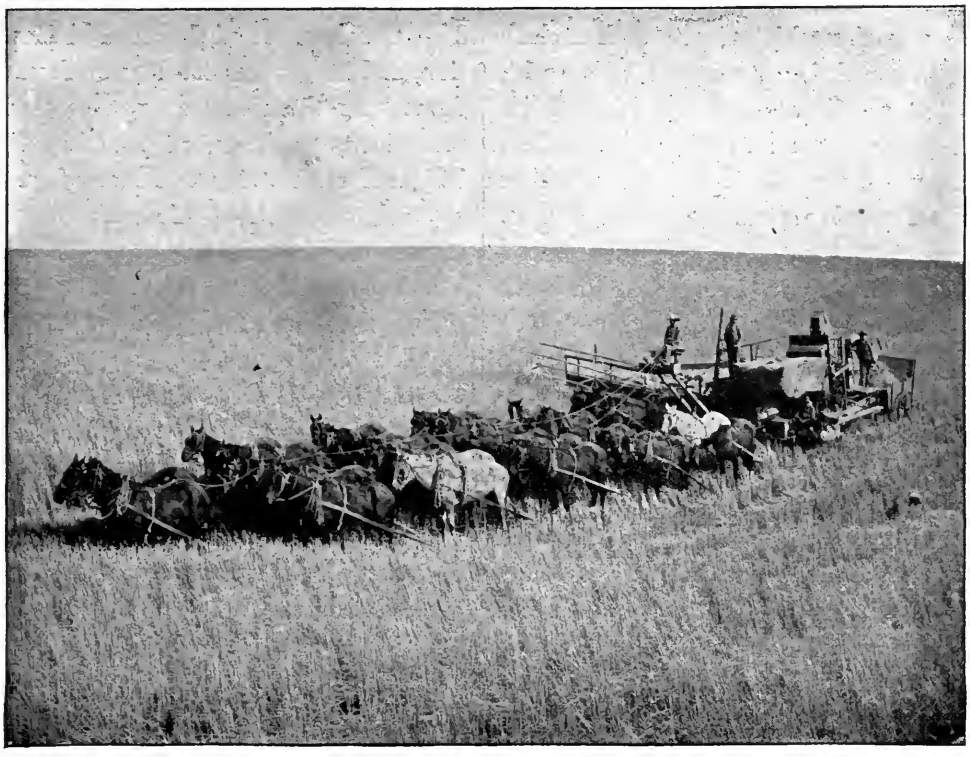
From the Lakes to the Pacific.

We decide to travel westward by the "Great Northern Flyer," that leaves Duluth at 7:55 A. M. We are pleased to see that this northwestern train has all the conveniences of a modern vestibuled train.

Seated in the observatory car, we are delighted with the panorama of field, meadow, wood, and lake. From our fellow-travelers we learn that this State of Minnesota has 80 counties, yet only two of these has less than 1000 acres of water surface. It is the Lake State of the Northwest, with more than 5000 lakes of area sufficient to be named on maps, while many more bear local names. Her fields of famous No. 1 wheat of nearly three million acres, with her barley, oats, flax and potato crops, make Minnesota a very important State for agricultural products as well as for her dairy, lumber, mineral and manufacturing interests.

We see the track of that other great transcontinental railway — the Northern Pacific — that has done so much to develop the resources of this region. Both roads link the lake region with the North Pacific trade centers of our Union, and reveal the important agency of railroads in establishing settlements and awakening trade. At noon we passed through the fisherman's paradise, the lake region reaching from Millehacs to Red lake, our line crossing it at Cass lake.

At 5:30 we reach the Red river of the North, the valley of which is the greatest wheat belt on the globe. Here wheat farms of thousands of acres each can be seen. A manager of one of these farms boarded the train at Grand Forks,



A Modern Harvester.

bound for Portland. From him we learn some interesting facts concerning the plowing, seeding and harvesting of a crop on a "bonanza" wheat farm. The farm under his management consisted of 7000 acres. Under him were three division superintendents. At each division headquarters were a dining-hall, dormitory, kitchen, stable and implement barns, and a blacksmith's shop. Two elevators are situated on opposite sides of the farm along the line of railroad that runs through the farm. These elevators have a capacity of 100,000 bushels of grain. Near the center of the estate is the manager's office, connected with the division headquarters by telephone.

The plowing is generally done in the fall, beginning in October. Each plow turns two furrows, and there are between twenty-five and thirty plows in each of the three gangs used on the farm. As early in April as weather permits, the ground is harrowed. Each man runs a twenty- to twenty-five-foot harrow, and can cover from 55 to 65 acres per day. As soon after harrowing as possible, seeding is begun. Each man runs an eleven-foot seeder drawn by four horses, and often travels more than twenty-five miles per day.

Harvesting usually begins about July 20th to 25th. This often calls for new machinery. Fargo is reported to sell nearly three million dollars' worth annually. Until recently, harvesters that cut, bind and bunch the wheat have been used; then the threshers followed. But this year our Dakota friend tried the use of a California harvester. This machine is run by a traction engine. It cuts, threshes and sacks grain from 50 to 100 acres in a day. This usually averages from 1200 to 1800 sacks per day.

We ask him about the sale of his wheat. He says he has a wire from his office to both Duluth and Minneapolis, and is in constant touch with the world's prices. Thus he keeps himself informed, and knows when and where is the best market. "Most of my wheat I sell Duluth at fifty cents to seventy-five cents per bushel, F.O.B. farm."

The best wheat each year is reserved for seed, so that a wheat well adapted to the climate has been obtained. Some fall wheat is sown, but the majority of wheat raised in the Red river valley is spring wheat.

From Grand Forks westward beyond the valley 200 miles, we see oceans of waving grain, stretching like the limitless sea from horizon to horizon.

We reach the largest body of water on the plains at 8:20. This is known as Devil's lake, 90 miles west of the Red river. This lake is fifty miles long and three miles wide. Here we find the Chautauqua grounds of North Dakota, Ft. Totten, and a Sioux Indian reservation.

We reach Minot at 11:30 P. M. We are told at this station to set our watches back for mountain time, and we go out nearly an hour *before* we came in. Minot is a division headquarters, and marks the line between the grazing and farming lands. We have climbed nearly one thousand feet nearer the sky since we left Duluth, 500 miles eastward. Settlements are now less frequent, while sheep, cattle and horses feed on the buffalo-grass that everywhere abounds. For many years here was the home of the buffalo, and it is estimated that the hunter in two years slaughtered at least half a million. But the buffalo has been driven from his native haunts, and a few hundred in the upper British Columbia country count all that now remain of the vast herds of the American bison.

Just at daybreak we reach Milk river station. We follow Milk river, an important tributary of the "Big Muddy," for 180 miles.

Just a little after ten o'clock we reach Chinook. This is the center of the Milk river valley irrigation, and the ditches can be seen from the car windows. To the south we can see the Bear Paw mountains, marking the southern limit of this irrigated region, that has more farm-houses than any other section of Montana that our railroad crosses. Twenty miles west of this point is Havre, where we renew food supplies. While this is being done we learn from an old miner that the train on the siding runs to the largest mining camp in the world, 300 miles away. "Where is that?" "Butte City. There is enough ore now visible to keep mills and smelters at work for half a century, while no man knows how much more the earth holds. Here, sir, we beat the world on silver, lead, and copper. We have a city of 12,000 of the busiest, heartiest, noisiest, sauciest, brightest, most hospitable people in the Rockies. We have the Paris of mining towns, the metropolis of hustledom, the capital of hullabaloo, the Athens of Montana." The city is on a mountain that is fairly honeycombed with mines, and is netted everywhere with railroad tracks. On account of its mills and smelters, scarcely a green thing can be found in the town.

This branch connects with the Northern Pacific at Helena, the capital of the State. The Northern Pacific and the Great Northern with their tributary lines comprise the Morgan-Hill system of railroads, covering more than 20,000 miles,—the greatest railway system in point of mileage on the American continent. Helena has an altitude of more than 3000 feet, is mountain-bound, and the center of the rich gold and silver mining district. This city, founded in 1864, has grown to be a very important center for mining commerce of this, the greatest copper State in the Union, while it annually yields millions of tons of gold, silver, lead, and coal.

Our train bears us now steadily upward. No steep ascents, few sharp curves, yet at 7 P. M. we

find ourselves on the Continental divide, in the midst of towering peaks with immense drifts of lodged snow. The train halts for ten minutes so its passengers can take a glimpse of this delightful spot — Summit Station. We are in a meadow of several hundred acres. Just north of us is "Divide Mountain," the waters from its melting snows going on the east into the Gulf, and thence to the Atlantic; and on the west, by the Columbia, is transported to the Pacific ocean. This meadow is the highest point reached by our railroad — 5200 feet above sea-level; yet we realize that we are in one of Nature's amphitheaters, with peaks that catch the sun's gleam from 2500 to 3000 feet above us.

In this backbone of the continent, less than fifty miles from where we are now standing, lies that "loveliest of mountain mirrors," Lake MacDonald. In this Lake MacDonald region, such glaciers, cascades and avalanche basins have been found, that it is not inaptly termed "The Northern Yosemite." Here then is the "Crown of the Continent," which tourists tell us is unsurpassed by the scenic Alps; and its wild regions have not yet been fully explored.

North of us Chief Mountain lifts its ice-clad crest 10,800 feet in air. Nestling in a valley near this mountain, we are told, is to be found the Geneva of America — the St. Mary's lakes. Great glaciers keep these supplied with water, while experienced travelers tell us that it truly is a region more wild and awe-inspiring than far-famed Switzerland. Few hunters have found this region; so elk, moose, deer and grizzly bears abound in the pine forests, while among the mountain-peaks are found more Rocky Mountain goats and "big-horns" than in any other region.

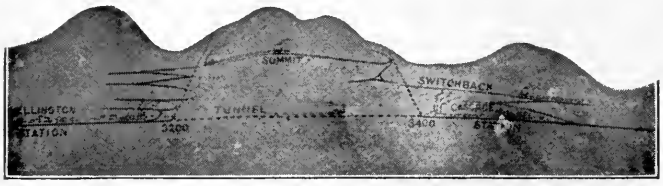
We are now 1125 miles west of Duluth, in the celebrated Blackfoot region of the Rockies.

Our train begins the downward descent. We pass through dense forests of coniferous trees; round rugged peaks whose hoary summits are lost to sight from the observatory car, but whose sides bear great ledges of solid rock or rich robes of velvet green. Frequently we see cascades of water silvered by the moonlight.

About two o'clock in the morning our train reaches Jennings. This is a good site for a large commercial city, as the fertile tobacco plains are adjacent, while the Kootenca river flows by the town. This river is larger than the Hudson; rises within one mile of the Columbia, and is fully 600 miles long, flowing through rich mineral lands. Its boats have a heavy traffic in ore. From Jennings for more than sixty miles we follow the canyon of this river, that finally bends abruptly to the north to flow into the lake of the same name in British Columbia.

Through the night our train takes us over trestles, plunges through forests, threads canyons, crosses divides, and at eight o'clock next morning we find ourselves in Spokane, that some geographers have sought to give to Idaho, but we find to be sure and safe by more than forty miles in the great State of Washington. Here we set our watches back to agree with Pacific time. In the very center of the city is found the falls that named the town. Here is located a great water-power station that transmits power for heat, light and mechanical purposes. Spokane is the center of a rich mineral, timber, and agricultural section of many thousand square miles in extent. This has made it a great shipping point, and has developed a railway center here. It is a city of more than 40,000, noted for its substantial buildings, modern conveniences, and general thrift and industry of its citizens, and is the metropolis of east Washington.

We now pass through the great areas of pasture and grain lands in the famous "Big Bend Country" of the Columbia river, covering an area of more than 7000 square miles. Grains, fruits, tubers, sorghum and tobacco are grown in this region. Wheat ripens here without rust, and a



Profile of Mountains crossed by Switchback, showing Route of Tunnel.

harvester drawn by more than a score of horses is used to cut, thresh, clean and sack the grain.

A little after noon we reach the Wenatchee valley. Situated at the junction of the river (after which the station is named) and the Columbia, is the half-way village between Spokane and Seattle —Wenatchee, surrounded with orchards and vineyards. Many tourists go from this point up the Columbia to the Lake Chelan region. This lake is sixty miles long; is the second deepest body of fresh water on the globe; and with Castle Mountain to the west, Goat Mountain on the east, a canyon at its foot thousands of feet in depth, and at its head 400 mountain-peaks, ranging from 900 to 11,000 feet high, embracing icy glaciers, in full view, surely this lake is a gem of the Cascade mountains, a Washington natural wonder.

We soon reach Leavenworth, at the foot of the Cascades, where an extra engine is attached to take us through the Tumwater (Talking Water) canyon. This is ten miles long, and follows the roaring, rollicking Wenatchee, that plays a rollicking game with boulders and cascades all the way. At four o'clock in the afternoon we reach Cascade Tunnel.

Until January, 1901, trains were taken over the mountains by means of the "switchback." A large twelve-wheeled engine was attached to the rear of the train, and the zigzagging up the sides of the mountain commenced.

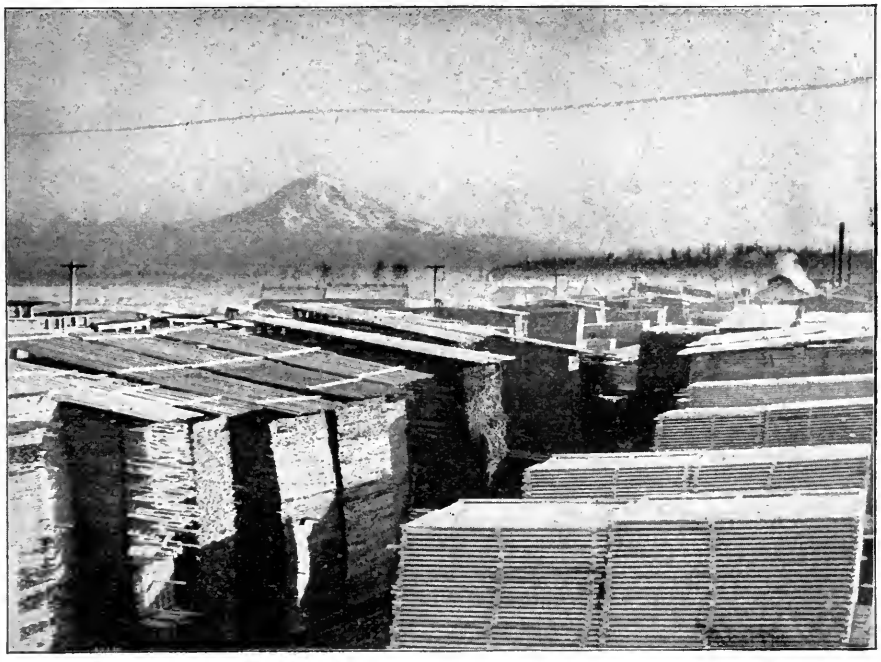
At the end of the first short length of track, called a "leg," the train stopped, switches were thrown, and the rear of the train became the head end until the next "leg" was reached, when switches were turned and the front end again became the head end, going up the mountain. In this way three legs on the east side, with an average rise of three and one-half feet to every hundred feet, brought the train to Cascade Summit, 4027 feet. The descent down the west slope was a four per cent. grade (four feet descent to each 100 feet), with four legs. This switchback was considered a unique feature in railroading, but the Cascade tunnel, opened to travel in 1901, is a marvel of engineering skill. It was begun in January, 1897. When the originator of the plan, Pres. J. J. Hill, spoke of it to railroad men, many laughed, and declared it would bankrupt the road. President Hill said that it would save twelve miles of track and several hours to the coast, and that the surplus revenue of the road should build it. Experienced railroad engineers with compressed air-drills and a thousand workmen went to work on the tunnel on both sides of the mountain. The excavated work was delivered by electric cars to large crushers having a capacity of forty tons an hour. The crushed fragments were mixed with sand and Portland cement and returned by the electric car line, to line the inside of the tunnel with a concrete wall four feet thick. In December, 1900, the two gangs of workmen met in the middle of the mountain, the two openings meeting without the variation of an inch. January 1, 1901, traffic was begun through this tunnel, which is two and one-half miles long, sixteen feet wide, and twenty-three feet high,—a memorial to the skill of American engineers.

We now prepare to go through the tunnel. Our coal-burning engines are removed, and an electric locomotive is attached to take us through the tunnel; so neither smoke nor gas will cause annoyance. A pumping-machine at the entrance runs huge exhaust fans, which, together with a system of pipes, keeps the air in the tunnel pure and wholesome. This ride through the tunnel is a pleasant one, for its white walls reflect the light from the

double chain of electric lights, and make "daylight" all the time.

At Wellington station, the west entrance to the tunnel, steam locomotives are substituted for the electric, and we are soon winding down into the wonderfully productive Puget Sound region.

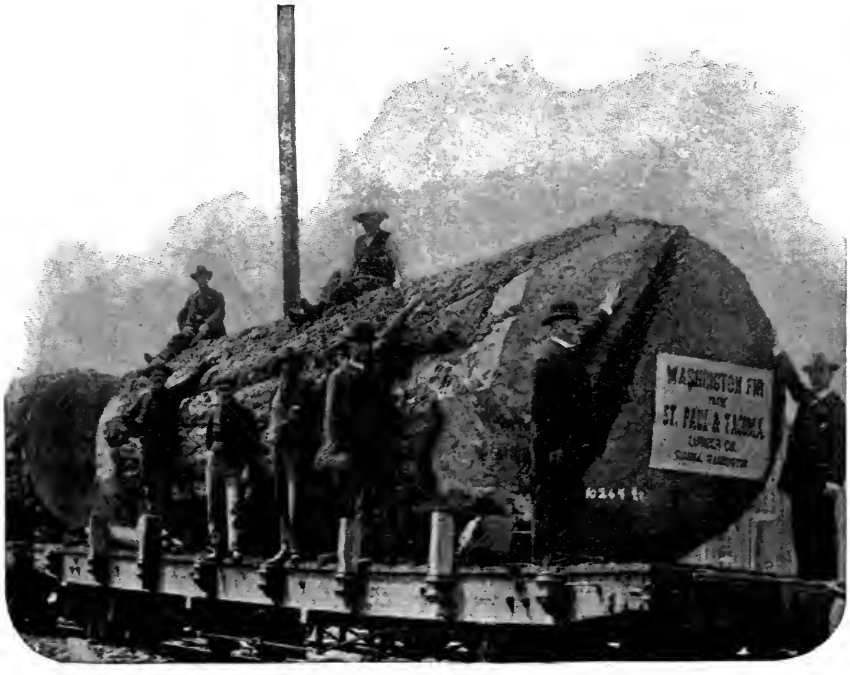
At six o'clock in the evening we reach Everett, and catch our first view of Puget Sound. Webster, in Congress, in 1845, spoke thus of this Northwest region: "What do we want of this worthless area of shifting sands and whirlwinds of dust; of cactus and prairie-dogs; a coast of 3000 miles, rockbound, cheerless and uninviting, without a harbor in it?" At Everett, a town less than twelve years old, yet with more than 12,000 citizens living in a modern city of substantial brick buildings, we are told that this Puget Sound region has as many good harbors as half the Atlantic seaboard.



Twenty Million feet of Lumber in one yard, Tacoma, Washington.

At half-past six we reach the great commercial metropolis of the Northwest — Seattle, 1800 miles west of Duluth. We find that settlers came to Seattle in 1852 to found a saw-mill. In 1869 the town of Seattle (named after an Indian chief of a friendly tribe) was incorporated as a city. Soon came railroads, industrial works, foreign trade, and in 1880 it was a city of 35,000. To-day it is a city of 100,000, with more than 4000 business firms, representing 250 lines of commercial interests. Her manufacturing interests show 19,000 men employed, with an output of fifty million dollars' worth in 1900. Nineteen miles from the city are the Snoqualmie Falls, 286 feet high, the source of Seattle's light and electric power. The second largest iron foundry on the Pacific coast is here.

View of Seattle, Washington.

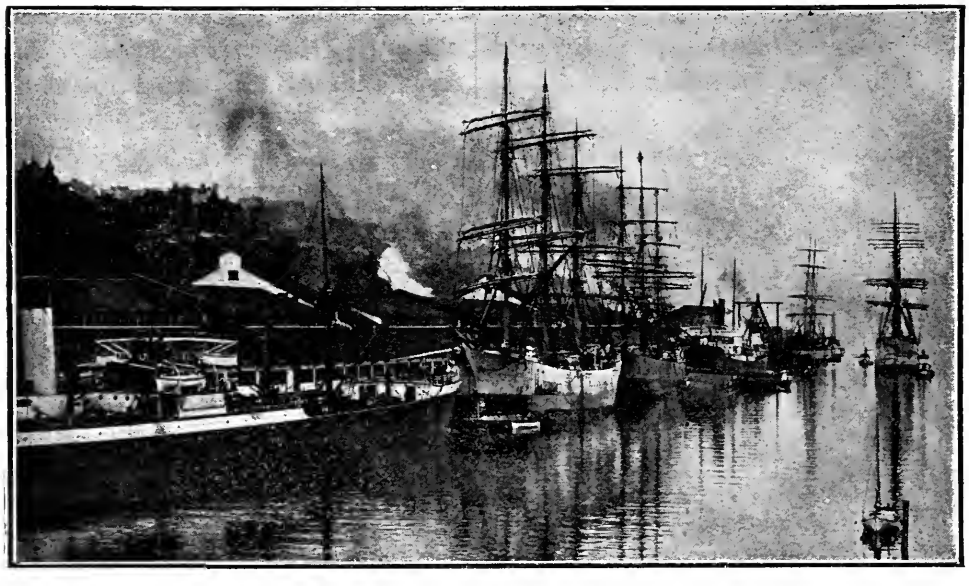


A Washington Saw-log.

Captain Reuton some years ago established a lumber mill on Blakely harbor, across Elliott bay from Seattle. It runs day and night, and is now one of the largest lumber mills in the world, owning its ships and sending lumber to all parts of the world. It turned out 125 million feet of lumber in 1900.

At her long sweep of wharves, vessels are loaded for the Alaskan ports and cities of the Oriental seaboard, as well as for Australia. Two new Oriental freighters, with a thousand-car capacity each, have just been put in commission, to sail from this port to Japanese ports. Captain Healy, in February, 1901, said that in twenty-five years Alaska and the Klondike would produce more actual mineral wealth than the entire world has contributed during the last quarter of a century. Seattle to-day has two-thirds of the Alaskan trade.

At Tacoma, a "Sound city" north of Seattle,



The Longest Wheat Warehouse in the World, at Tacoma.

A Salmon Catch—Puget Sound.

are located great lumber mills, box factories, and more than 240 industries, employing so many hands that it has the largest factory pay-roll on the coast, save San Francisco alone. Here we find the wheat port of Washington, with splendid wharves for her greatly growing ocean commerce. Lately the "Glen" line of merchant steamers to London via Suez Canal has been added, making over twenty steamers that ply between Tacoma and the Orient alone. We find that her chamber of commerce reports her imports and exports for quarter ending March 31st, 1901, to exceed four million dollars. She ships more flour to the Orient than all China imported five years ago. Twenty years ago this city had barely 1000 inhabitants; to-day it is a city of nearly 50,000.

We spend three days in this Puget Sound region, and find that its 1600 miles of shore-line affords facilities for the safe handling of a commerce equal to the whole Atlantic coast commerce of our nation. The fisheries include oysters, clams, crabs, smelts, herring, cod, sturgeon, halibut, and mackerel, while more than 6000 men and boys are employed in the salmon industry, over a million cases of salmon being shipped from a single season's catch. Ninety-five varieties of food fish are found in this sound. Fringing these shores are the greatest forests of fir, cedar, hemlock and spruce in the world. This State of Washington contains thirteen millions of acres of valuable timber, that statisticians tell us will furnish one billion feet of lumber per annum for twelve centuries. Many of these trees are from 200 to 300 feet high, and measure from 10 to 75 feet in circumference. Washington's mineral wealth has scarcely yet been realized; her tide lands have been known to yield

from 40 to 50 bushels of wheat per acre, 140 bushels of oats, and average 1500 pounds of hops, while some places yield 3000 pounds per acre; and the average yield of potatoes is 160 bushels per acre.

Seattle being 950 miles north of San Francisco, makes this city 500 miles nearer the Orient trade and a thousand miles nearer Alaska. Her location and natural advantages mark Seattle as a fair rival with San Francisco for the growing trade of the Pacific lands.

As the Sound steamer bears us back to Seattle, the lowering sun reddens the crest of Mt. Rainer, the white-headed sentinel whose summit is 14,529 feet above the sound's level, and then "Old Sol" sinks into the Sound. As we pass up to our boat's pier we catch a glimpse of the "Nebraska," a battle-ship built at Seattle, whose bows are twenty feet higher than the three-story buildings, just behind, in the city. Fair, beautiful land, where the industrious, inventive Yankee is destined to multiply your riches and enhance your present splendor and wonder.

Here we steam past Japan and Port Arthur steamers this July night, taking a cargo for their Oriental ports in sight of ice-clad and snow-covered mountains, silvery cold, in the moonlight.

Thus we enter the Empress City of the Northwest, and prepare for our long-distanced Pacific voyage.

A Trip through the Pacific.

We desire to visit our mid-Pacific neighbors. How can we go? We will take one of the new commercial freighters; it was put into commission in 1901, and plies between Honolulu and Seattle. The steamer we select has a measurement capacity of 28,000 tons, and will carry 20,000 tons of freight. Its deck room is for freight purposes, and covers five acres in extent, while it carries the load of fifty ordinary freight trains of thirty cars each. This vessel is larger than both the St. Louis and her sister ship St. Paul, two transatlantic passenger liners described in a preceding chapter. Our ticket to Honolulu costs us $75, for our port is 2364 miles away. This is what it cost us from Boston to Seattle, the route we took covering 3425 miles.

We purchase our ticket, and find our stateroom amidships on upper deck. Leaving our belongings here, we hasten out to see what the stevedores are loading our liner with. We find that they are giving her a cargo of lumber, flour, and miscellaneous merchandise. The steamers from this port in 1900 took fifty million feet of lumber, flour, and wheat, and thousands of dollars' worth of miscellaneous products.

Slowly we move down the bay, past the West Point Light, five miles northwest of Seattle, and, entering Admiralty Inlet, steam along the shore of Whitby Island until we reach Port Townsend's wharves. We touch here to take on additional cargo. Just a few feet from end of Port Hudson, on the wharf, we see the Government post light established here in 1887, and rebuilt in 1894. This is a white lantern, while two miles northwest, where the inlet enters the Juan de Fuca strait, the dark lantern on top of a low conical tower, above a white dwelling, indicates to our pilot, Point Wilson Light. On the east side, at the entrance of the inlet, is the Admiralty Head Light. This is at Red Bluff, Whitby Island, and also has a dark lantern, but is on a square wooden tower rising from the south end of a white dwelling. Here we swing to the west as we pass out between the two lights and enter the strait. Eleven miles to the northwest flashes the Smith Island Light, and directly ahead gleams the new Dungeness Light.

Across the strait at the west entrance of Esquimault Harbor, Vancouver's Island, shines the British Fishguard Light. Far beyond all these lights, in the strait near the national boundary-line, is the Race Rocks Light, flashing white every five seconds; and in case a fog is prevalent, it blows

a five-second fog signal every seventy-two seconds. If the northern portion of Juan de Fuca is free from fog, its four-blast signals tell this comforting fact to any fog-enveloped steamer.

Cape Flattery Light Station, Washington.

Carefully our pilot directs our course toward the Ediz Hook Light, which is the beacon that guards the entrance to Port Angelus harbor. Here, in October, 1895, the United States Navy Department established a naval station for the United States Pacific squadron. Speaking of this harbor, Rear Admiral L. A. Beardslie said: "This is a marvelous work of nature. There are no sandbars to interfere with the movements of the ships. Once the ships are here, I have no anxiety about any accidents. No rocks, no shifting sands to be continually watched. Smooth sailing right into port, and perfect anchorage anywhere you drop your anchor. It is indeed a 'harbor of refuge.' The wonder is that the harbor has never been discovered by the Naval Department before."

Here is Port Angelus, the "Gateway City" of the straits, seventy-five miles northwest of Seattle. This city is the county seat of the forest county of Clallam, that shows 1,000,000 acres of timber land. Clallam county lumber-men claim 84,100 feet of lumber has been obtained from one fir tree seventy-five feet around.

The cover of darkness prevents our seeing the picturesque scenery that surrounds this "Gate City" of the Northwest, and with our vessel headed westward we know no more until the call to breakfast brings us from our stateroom to the dining-room. After breakfast we seek the deck. We are now nearing the ocean, whose rolling waves are just ahead. To the north, at the most southern extremity of Bonilla Point, Vancouver, is the white square wooden tower whose red lantern tells the sailor its name is Carmanah Point. Here vessels can, by the International Code signals, communicate with Victoria by telegraph.

At the very entrance of the strait on Tatoosh Island, one-half mile northwest of Cape Flattery, is Cape Flattery Lighthouse, a gray stone dwelling surmounted by a white conical tower that bears the lantern. Here is located a signal display station connected with Port Townsend by telegraph. Thus we see our Government has provided for the protection of life and property at points of danger on sea and sound, as not only lighthouse service but life-saving stations are also found here.

In another chapter it is shown that like giant sentinels, flashing their long pencilings of light, stand the coast lighthouses, to direct the intrepid mariner in his commercial voyage along dangerous coasts where the tumultuous waves of jagged reefs render navigation hazardous. The lights known as "sector lights" are the harbor lights that point out the channel to the vessel pilots. At other places, beacons, spindles, fog-horns and whistling-buoys help to divide the ocean up into highways which all sailors understand and all commercial nations agree in maintaining.

Then we see the ocean has its sign-posts and its signals to understand, which is the first duty of the sailor.

We now feel the "ground swell," revealing beneath us the power of a mighty force, and causing many of our number to grow strangely weak, faint, and sick. They seek their staterooms, and do not again appear on deck until the third day out. But our trip across the Atlantic has "immuned" us from seasickness, and we enjoy the sight of the dancing waves in the morning sunlight. Cape Flattery, 140 miles from Seattle, slowly shades into the eastern blue, and our ocean voyage has really begun.

Sea-Gulls on the Pacific Ocean.

What are these large white birds flying seaward just ahead? They are the most active scavengers of the ocean, the bird monarchs of the Pacific — the sea-gulls. It is no uncommon thing for a score or more of these birds to accompany a vessel in its voyage, feeding on the refuse which is thrown overboard. Some years ago one of these birds was caught by the passengers of a steamship just as it left San Francisco harbor on its voyage to Japan. A piece of red tape, with date and location, was tied fast to one of its legs, and the bird set at liberty. That bird was one of many gulls which followed the steamer into Yokohama harbor, over 4500 miles away.

At noon our vessel takes her bearings, and from these data makes up her log. How is this done? Every ship is provided with a chronometer which registers Greenwich time, the focal time for longitude and time reckoning. At exactly the noon instant by the captain's watch, registering Pacific time, the difference is noted between the captain's watch and the ship's chronometer to the very second. This was found to be 38 hours and two seconds, which, reduced to longitude, equals 129° 30′ 30″. Each ship is provided with an instrument called a sextant, which measures the height of the sun above the horizon in degrees, minutes, and seconds. The captain of the ship, knowing over what parallel the sun is vertical each day of the year, sees by the sextant how far from the vertical he is, and in this way computes his latitude, which on this occasion proves to be 47° 30′ north latitude. We see, then, that by use of accurate time-pieces, one to measure Greenwich and the other Pacific time, the exact location at sea can be determined.

Distance in miles requires another factor, as degrees of longitude are not of the same length at all places on the earth's surface, for the length of a degree decreases toward the poles, where the meridians all meet, and reduces a degree of longitude to zero. Below is a schedule in sailor's miles, which, we must bear in mind, is the unit adopted by the United States Coast Survey. By this authority the value of nautical miles is declared "as equal to one-sixteenth part of the length of a degree on the great circle of a sphere whose surface is equal to the surface of the earth." This gives the nautical mile a length of 6,080.27 feet — practically 800 feet longer than our land or statute mile. Then a nautical mile covers 1.1515 statute miles, and a common land mile equals .869 of a geographic or nautical mile.

The following table helps us to understand the mathematics that the sailor uses to determine his distance from shore where location is recorded:

LENGTH OF A DEGREE OF LONGITUDE.

(In nautical miles.)

At 0 degrees latitude (equator)	60. miles.
At 5 degrees latitude	59.875 miles.
At 10 degrees latitude	59.193 miles.
At 20 degrees latitude	56.487 miles.
At 30 degrees latitude	52.093 miles.
At 40 degrees latitude	46.088 miles.
At 50 degrees latitude	38.609 miles.
At 60 degrees latitude	30.127 miles.
At 70 degrees latitude	20.608 miles.
At 80 degrees latitude	10.461 miles.
At 90 degrees latitude	0. miles.

That night, as we saw the sun overcome by the seemingly boundless stretch of water and his dying

light tinted the waves with variegated and ever-changing hues, we tried to comprehend the full meaning of the statistician who states that two-thirds of the people of the globe live in lands whose shores are washed by this ocean. That more than one-third of all the earth's surface is covered by this ocean. That the Pacific is not only more than twice as large as the Atlantic, but into its great basin you can place Asia, Africa, Europe, Australia, North America, South America, and all the islands of all seas, and still have a body of water left that would be larger than both the Arctic and the Antarctic oceans. When Balboa waded out into its depths in 1513, off the Central-American shore, and took possession of that sea and the shores that it washed in the name of Spain, he little knew the extent of the empire of land and water that he had seized.

Bearing to the southwest for ten days, we early one morning, like Roderigo Triana, "sight land." The first land sighted coming from the north in this ocean highway is Oahu. Showers become of frequent occurrence, and we here behold our first perfect rainbow, every part of the arch clearly visible in bright prismatic hues. We later learn that the islands are so noted for these beautiful rainbows that this mid-Pacific group has been nicknamed the "Islands of Rainbows."

We now pass along the northwest shores of Molokai. This is the island that has a leper settlement, the colony being situated upon the peninsula in the central part of the northern coast. There are two villages, Kalawao on the one side and Kalaupapa on the other side of the peninsula. This settlement comprises about 3000 acres, and was set apart for the lepers in 1865. From all the islands, lepers are sent to this colony, where skilled physicians and modern hospital service give the best medical aid to the unfortunates, afflicted with this incurable disease.

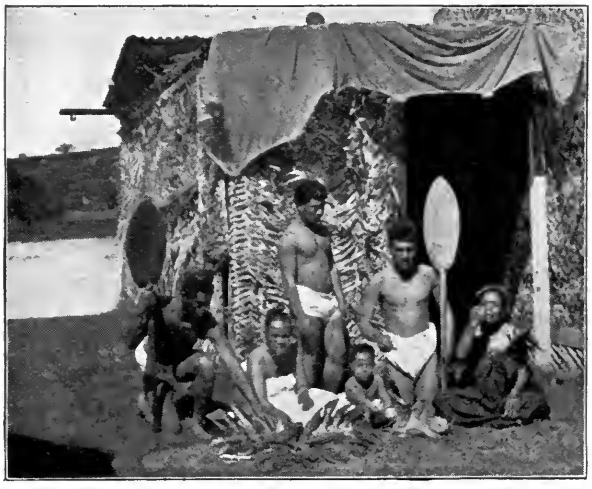
Our steamer rounds the Koko head, the most southern point of Oahu, and we now catch a glimpse of the cocoanut groves, sugar plantations and pasture-lands that fleck the shore-land, while the wealth of foliage and flower bedecks the entire landscape with a richness of color freighted with perfume as morning breezes waft the dewy fragrance seaward.

After doubling Diamond Head or Leahi, whose precipitous sides lift its crest 700 feet in air, we receive the harbor pilot. With him came the health officer, whose business it is to see that all on board are well. Should he find any sick with a contagious disease, our ship would be anchored at quarantine island until there was no danger to those on shore. These native Hawaiians catch contagious diseases quite easily, and every precaution is used to keep out contagion.

Our pilot leads us at half-speed through a narrow channel made by a large coral reef offshore, which forms a natural breakwater to the harbor. The channel is carefully buoyed on either side, to aid the ship's pilot. At night, with their safety-lamps, these become floating beacons to direct steamers entering after nightfall. Just on the other side of the coral reef is a thirty-foot lighthouse, to make the passage still more secure.

We found the Honolulu harbor a spacious one, with room for at least 100 large steamers like our own, with an average depth of 90 to 100 feet. The wharves are ample and very substantial, with high coverings to shield the laborers from the tropical sun. As our steamer moves up the dock to her pier, numbers of Hawaiian lads swim around the bows, crying, "A-lo'ha, aloha." (My love to you.) The passengers please the boys by throwing coins overboard for them to dive after. The boys show themselves true "water babies" by their remarkable skill in both diving and swimming.

The gang-planks are let down, and we stand on the dock of the commercial port of the whole group of islands — Honolulu. We find this city to be modern in every respect, with 30,000 inhabitants. Being a mid-Pacific port, steamers of all commer-



Group of Natives Eating Poi, Hawaiian Islands.

cial nations stop here, and hence it has become quite a cosmopolitan city. We find twelve islands in the group, but only eight are inhabited. Their area is about equal to the State of New Jersey, with approximately four million acres of land. When Capt. Cook discovered the islands, in 1778, he estimated the natives to number 300,000. To-day the census reports but 31,000 native Hawaiians, while half-castes, Chinese, Americans, Japanese, British, Portuguese, Germans, French and Norwegians make up the rest of the 110,000 people on the islands.

Prior to 1819 these Hawaiians were only barbarians, victims of the very worst superstitions. It was American missionaries from New England who Christianized and civilized these island people; and for this reason, probably, they look to our nation as their great benefactor.

In the early days each island had its own king, but King Kamehameha succeeded in making the conquest of all the islands, and established the government that existed until the republic was formed, July 4th, 1894. The Pali of the Nemam Valley marks the spot where the Oahu natives made their last stand against Kamehameha, over which precipice they were driven to their death.

We take a Hawaiian coast steamer, and make a hurried trip around the islands. The Hawaiians grow the taro, a root cultivated as the Chinese do rice. From this tuber is obtained the flour from which the principal native food is made, "poi" — their staff of life. We find sugar the chief product of the islands; the average yield upwards of 300,000 tons annually. While rice, bananas and cocoanuts are marketed, and coffee is now being successfully raised, delicious fruits abound and apples grow wild here. The climate is so nearly ideal that the native language has no word for "weather." Beautiful ferns,— green, pink, red and purple,— palms and flowering plants are seen on every side. The group is named from Hawaii, the largest island, that has two large volcanoes. One, Mauna Loa, celebrated the Fourth of July, 1899, by starting a prolonged pyrotechnic display.

Avenue of Royal Palms, Queen's Hospital Grounds, Honolulu, Hawaiian Islands.

Its streams of lava often flow down the sides of the volcano for many miles.

There are three railroads on the islands: a 73-mile railway on Maui, a 20-mile railway on Hawaii, and a 39-mile railroad on Oahu. The railroads are chiefly used to transport freight to the coasts for the steamer trade. This coast traffic employs sixty vessels, that have direct or indirect connection with the trans-Pacific liners at Honolulu.

The rugged shores of many of the islands, deep valleys like the Ia'o of Maui, walled in by cliffs from 3000 to 6000 feet high, and precipices like the Pali of Oahu, together with many craters of extinct volcanoes, mark the islands as volcanic in origin, with many fringing coral reefs. The highest point in the whole Pacific region is Mauna Loa, over two miles high, and the largest active volcano on the globe is Kalama, whose crater is nine miles in circumference. Its fiery lake of lava we find the natives had long ago named Ha-le-mau-mau (the house of everlasting fire). Hilo, thirty-two miles from this volcano, is the second city of the island group. Hawaii, on which these volcanoes are situated, is about the size of Connecticut.

We now take the steamer from Hilo to Honolulu, where we purchase tickets for Sydney over the Oceanic steamer line via Apia. As we leave these beautiful islands, rich with commercial products, the center of a commerce fast nearing 200 millions of dollars annually, a land where illiteracy is well-nigh unknown, where the most valued elements of tropic and temperate climes seem sifted from the objectionable, a land devoid of reptile life, and where sunshine seems perpetual, we realize that this is destined to be a mecca to travelers and a most valuable commercial exchange for our nation.

We are now under the British flag, and steaming nearly south. As we cross the 160th meridian we deflect to the right, and for 2000 miles through the trackless waste of waters we pass without a glimpse of land or an incident of interest save one — when we cross the Pacific "Doldrums" and the equator. At longitude 161° 30′ we reach the region where the northeast trade wind, that has been our constant companion for more than twenty degrees of latitude, gradually loses its force, until, from blowing at a rate of sixteen to eighteen miles a day, it does not blow two miles. At four degrees north latitude we enter the region that the Spanish have named "The Doldrums" from their word "dolorosa," meaning tormenting. Here the southeast and northeast trades meet, and for a distance of 300 to 500 miles they neutralize each other. This is tormenting to sailing vessels, but little impediment to the modern steamer. In some places in the ocean there is no dividing-line, and vessels can run from the northeast trade at once into the southeast trade wind. This region has been called the equatorial calms, lying on or near the equator. The width of this calm belt on our voyage was but 150 miles; then we came into the region of the southeast trade, that gentle wind that wafted Magellan's vessel across the ocean in 1521, and led him to call it Pacific, as he had a stormless voyage. These trades being constant, gales rarely occur, while fogs are almost unknown. Hence these regions are a source of delight to the mariner, giving him little anxiety and his crew a measure of relaxation.

We now experience the fun-sparring time of crossing the equator. It is the custom on this vessel to initiate the inexperienced as the boat passes from north to south latitude. So, blindfolded, we "rode the goat," "fell over the precipice" into the seething billows, to finally receive a shower bath — Neptune's blessing on his newly christened son. For two hours Neptune with his trident ruled our ship, being received by a row-boat off the bows at 11 A. M., and with garlanded trident waving in the air he disappeared off the stern at 1 P. M. "Neptune's christening" occurred at 165° 30′ W. long., 0° latitude.

After an eight-days run we reach Apia, the Samoan port of entry for our steamer. Here oc-

curred that terrible storm that destroyed some valued warships, but settled an international wrangle, March 16, 1889. These islands are 2400 miles northeast of Australia, consisting of thirteen inhabited islands and several islets. The natives are superior to most Pacific islanders, many having become both civilized and Christianized. England, Germany and the United States drew up a tripartite treaty in 1890, establishing a joint protectorate over these islands. The new treaty of 1899 granted to Germany, Upolu, Savaii, and the islands of the group west of 171° west longitude, and to the United States all the islands east of 171°. The old geographies called this group Navigator's Islands. The poet Stevenson found this land the "Summer isle of Eden, lying in dark purple spheres of sea," that Tennyson describes in his dream of Lotusland. In the hills north of Apia, Stevenson had his home. This city is on Upolu island, and is one of the most prosperous towns in the south seas.

While the "Alameda" is delivering her agricultural implements and miscellaneous dry-goods and taking on cocoanuts, we take a detour into the island. We learn that none of the islands have railways, canals, navigable rivers, or even so much as a wagon route or a caravan trail. Here nature provides food, and the natives "toil not, neither do they spin." They seem to be content to "eat, drink, and be merry." While not industrious as a class, the Samoans are almost a perfect type of physical manhood and womanhood. They are a simple and lovable people, yet bright, and quick to learn. We are unable to find a Samoan who cannot read and write. We find the island supplies itself with corn, coffee, and sugar, and raises for its export trade, coffee, cotton, and bread-fruit. We return to our steamer under a canopy of flower-clad trees filled with singing birds and freighted with perfume. We have been told: "When a man goes to any of these favored islands to live, no inducement beyond the glitter of gold will ever lure him away. Life there is a dream. Sunshine and flowers and birds are ever in the air; summer is the only season; contentment is the one great sentiment that seems to blossom in the evergreen trees and plants, and to spread its fragrance everywhere." We found it even so.

Twenty-five miles southeast of Upolu we cross the 171st degree of longitude, and enter the waters controlled by the United States. A few miles further on we sight the island of Tutuila. Here we enter a land-locked harbor, approximately four miles long, and from one-half to a mile wide, and from 100 to 200 feet deep. Naval experts state that the whole American navy could find safe anchorage here, while the Kearsarge and Kentucky at the entrance, with a fleet of three submarine boats, could keep out the world's combined navies. It is Pago-Pago, the finest harbor of this ocean of good harbors. At the head of the harbor is the native hamlet of Pago-Pago.

The island is almost divided by the harbor, being from three to eight miles wide. It is twenty-one miles long, and contains about sixty sugar mills. It is volcanic in origin, as are most of the mid-Pacific islands. The tallest summit rises 3000 feet, but it has been wasted considerably in the centuries the volcano has been extinct. Between the sea and the mountains is a fine slope where the natives have their farms. Here they raise cocoanuts, yams, sugar cane, and many tropical fruits. There are excellent fish found in the harbor, and the canal formed around the island by the coral reefs has five openings which afford five good reef harbors.

While 4000 natives live here, Robert Mackay declares 100,000 would find a fruitful dwelling-place on the Island. Notwithstanding its tropical situation, Tutuila has a healthful climate for Americans as well as Samoans. A system of schools has recently been established by the United States, and steps taken to fully develop the island.

The islands of Manna, Oloosinga, Ofoo and Rose lie eastward from Tutuila, only one affording an-

chorage for ships — northwest coast of Manna, about ten miles steaming from Pago-Pago.

The United States flag was raised at Tutuila April 17th, 1900, by Commander Tilly, commandant of the United States naval station here. The natives signed an agreement which acknowledges United States authority over the islands, and contains a promise to obey American laws.

We visited a grove of bread-fruit trees while on the island. The tree is of medium height and size, and has large leaves, glossy green in color. The fruit is shaped something like a Hubbard squash, and about the size of a medium squash. Many eat it raw, but the Samoans roast it as our grandmothers used to roast potatoes — in the ashes. It tastes something like bread with a small amount of sugar in it. We are told that the tree has fruit every year and all the year round. It constitutes the staple food of the South Sea Islanders. The timber is used for boats, and from the fiber of the inner bark of the bread-fruit tree a cloth is made; hence the tree is a valuable one to the natives. Had they the rain tree of Africa and the cow tree of South America, they would have food, drink (water and milk), shelter, and clothing,— satisfying the chief wants of mankind.

As our steamer moves out of the harbor we are reminded of what an essayist has said: "As the traveler sails away from the island on which the white moon is shining down so peacefully, a feeling akin to homesickness seizes upon him, as if he could not bear to go away from this fairy-land of nature, back to the hurry and noise and bustle of civilized lands."

At noon the next day we reach the International Date Line. Theoretically this line is on the 180th meridian, but practically it coincides with this meridian for about half its distance across the Pacific — 40° N. to about 5° S. latitude. As marine time is usually reckoned by the meridian of Greenwich, commercial nations have tacitly agreed to reconcile dates at sea on this 180th meridian, just half-way round. Hence it is called the International Date Line. One other reason why mariners selected this longitude for adjusting dates, could be, that this meridian is nearly in the central part of the Pacific and passes through but few bodies of land. When Alaska was ceded to the United States it had Asiatic time, but now the date line passes west of the Aleutian Islands; hence it deflects to the west of the 180th meridian, so all the islands may have the same time.

The Fiji Island group is crossed by the 180th meridian, but so all the islands may have the same time as the rest of the British possessions in Polynesia, the international date line is made to deflect to the east of the 180th meridian, as shown on the world map of this text.

The Spanish traveled west from America to discover the Philippine Islands, and took their Spanish-American date with them. Although there was a day's difference between Manila time and that of its nearest commercial neighbors,—Japan, Borneo, Java, and China,— the Spanish persistently refused to change and conform with Manila's neighbors for over three hundred years. Thus the international date line was made to bend to the west 60°, to place Manila east of the line. When nearly all Spain's American colonies gained their independence, in the early part of the nineteenth century, the Filipinos had to look to their neighboring coasts for trade. Their time was now twenty-four hours behind their commercial neighbors. Sabbath in Manila meant a work-day in adjacent East Indies, and this confusion of dates led Manila merchants to demand the same time as their neighbors. Spain, in answer to this request, struck December 31st, 1844, out of the Philippine calendar. Thus, on January 1st, 1845, Manila caught up with Asiatic time.

As there is no international legislation defining the exact location of the international date line, the position is not given exactly the same by all geographers. All the possessions of the United

States except the Philippines have the same day. Manila time is about eleven hours earlier than Washington time. When the steamer's chronometer indicates the noon instant, the whistle blows and all watches are set forward. Members of our party could not understand just why and how this change corrected the commercial time. We made an appointment after dinner with a ship's officer to explain this to us, and below is the explanation that he gave us in the ship's saloon or parlor that evening:

"The earth in one rotation passes through 360 degrees — an entire circle. It requires twenty-four hours to do this; hence it passes through fifteen degrees each hour. Then for every fifteen degrees that we sail west we find local time one hour earlier. While people say they have lost an hour, remember this is a relative statement, for of course we have neither gained nor lost time. Our day seems one hour longer, and we find our watch one hour fast for every fifteen degrees traveled. Going east, the watch will be one hour slow for every fifteen degrees traveled. Now let us consider a concrete illustration by way of application.

"There were three brothers in St. Louis who resolved to practically test the international date line problem in the following manner: One was to travel around the world, going east via New York; one travel around the world, going west via San Francisco, and so time his journey that he would meet his brother on the 180th meridian; the third brother was to remain at home, and be prepared to compare notes at the close of year with the globe-trotters. On January 1st, 1897, the first brother started for London. When his steamer reached that port, the second brother started for the 180th meridian via San Francisco. When brother No. 1 reached the line it was Monday, and the log of his steamer showed the double record, like the one ours made to-day. Their Monday at once became Sunday, marking American time. Brother No. 2 reached the line, coming from America, with a log bearing Sunday date, which was made to date ahead to Monday to agree with Asiatic time. Thus one steamer had two Sundays and the other had practically no recorded Sunday that week. On the evening of December 31st, the three brothers met in their St. Louis home and compared years. Brother No. 1 had a record of 366 days; brother No. 2, 364 days; and brother No. 3 a record of 365 days for the year.

"Custom has made the law that when a ship crosses the international date line from east to west its log shall register the double record we recorded to-day, as we find just that much difference between American and Asiatic Australian time. Ships crossing the international date line from west to east (from Australia and Asia, America-bound) register the same day twice in succession, as brother No. 1 in the illustration counted his Sunday twice, his Monday being turned back to Sunday. By doing this, Asiatic and Australian time is at once converted into American time. Thus you see when we change from west longitude to east longitude we also change from the time of the western to the time of the eastern hemisphere."

We thanked the officer for his concise explanation; and while all agreed that it was plainly presented, the international date line problem was the theme of discussion for several days. At most any hour of the day we could see a group gathered in earnest discussion, and we knew at once the topic was the "lost day" problem. It has been agreed that the application of the United States system of standard time to the commercial world, with Greenwich time belt as the unit of the time belts, divided like ours into hour divisions, would be more convenient and much less perplexing to the world at large.

We are now in the very central portion of Polynesia, that "milky way" of islands that spreads out for thousands of miles east and west and hundreds of miles north and south in the south Pacific. Because the islands vary in size and largely

lie in groups owned by many nations, they truly are "Poly" or many lands. Stretching many thousand miles east of the southern portion of the Philippine group on the other side of the equator from Polynesia, are the much smaller and more isolated islands of Micronesia. In this archipelago may be found Wake Island. This is a small island taken possession of by Commander Taussig, for the United States, in January, 1899. It is 2000 miles west of Hawaii, in the direct line of trade with Hong Kong.

Miles west of Wake is a group of fifteen small islands known as the Ladrone group. The largest and most southern of this group is Guam. This island was ceded to the United States by Spain in 1899. It is being fitted up for a naval and coaling station, and will be a station on the new Pacific cable now being projected. The island produces cocoanuts, rice, sugar, bread-fruit, and bananas. Its one export is copra (dried cocoanut). The island is about 100 miles in circumference.

We pass to the east of the Fiji islands, that were the last of the South Sea islands to give up cannibalism. Many of the natives of this group have substituted dirt for human flesh as an article of food. As we — who might be served up fried, broiled, or baked — think of it, we can but be glad of the change. The dirt chosen for food is supposed to have been a volcanic ash. The women of the islands seem to especially like this new article of food, and the coolies imported by the English for laborers are said to eat this dirt food greedily. The largest island of this group is Vita Leon (Big Fiji), 100 miles long and 60 miles wide. On this island is the harbor of Suva, said to be one of the largest and best harbors in any ocean. Here is logically the central point for government control, and at no distant day the Fiji capital will be located at this point. Freed from malaria, without reptiles or vermin, and with delightful southeast breezes and a mean temperature of 80 to 82 degrees, these islands are capable of great agricultural and commercial development.

The islands were annexed to England in 1874, and that nation is developing a diversified crop, establishing mills, building roads, and giving the islands all the elements of modern civilization.

After we cross Capricorn we find the monotony of sea and sky forgotten as we study the movements and gracefulness of that bird of nautical romance that is now seen to frequent the waters — the albatross. It seems to literally sail upon the wind in any direction, as scarcely a movement of its wings can be discerned, though it may fly with, across or against the wind. So swift and powerful is its flight that it has been jocosely remarked that "the albatross can breakfast at the Cape of Good Hope and dine at New York." It ofttimes flies so near the water that shipwrecked sailors have been able to reach up, catch its legs, and be dragged to a floating spar or place of safety. Hence the albatross has been named the "sailor's friend."

After six days from Samoa we reach the beautiful harbor of the "Naples" of New Zealand — Auckland. This is the metropolis of northern New Zealand, and the former capital of the country. This region, an isthmus in the northern part of North Island, is rich in legends, as it was the "fighting-ground" for centuries for the natives. When the missionaries came here in 1814, human flesh was the main subsistence.

We find that this is the most remarkable volcanic region in the world. One hundred and sixty miles southeast of Auckland, in the central part of North Island, are the geysers, known as the Hot Lake District of New Zealand. Merchants on Queen street, Auckland, told us that earthquakes in 1855 raised their coast-line four feet for miles up and down the coast. They also said that a chain of supposedly extinct volcanoes along the backbone of the islands suddenly became active in

1886, and buried many entire villages, destroying all the villagers.

We learn that this city is the center of a large timber belt, rich in trees of commercial value. The kauri tree is the pine of New Zealand, bearing somber green leaves instead of needles. It is slow of growth, requiring 800 years to mature, but while it is easily worked, it has a close grain, is exceedingly durable, and will not easily split nor readily warp. Its average height is 100 feet and diameter 15 feet. The tree yields a gum that is an important article of export. It is found five or six feet under ground, in a fossilized form. It is the process of years that causes this change, which makes it of commercial value, as the fresh gum has no market. The fossil gum is used in the manufacture of varnish.

Fern trees thirty feet high are seen beside deciduous trees and plants that have been planted by the English since New Zealand became a recognized colony in 1840, three-quarters of a century after Cook discovered the islands. Here, too, we find the "sweet-scented" manuaka, the fragrant veronica, and the lofty rimu tree, about whose lofty trunk the gigantic rata, a veritable boa constrictor, twines the Gordian knots nothing can untie and often saps the very life of the tree. The pride of the Maoris (the natives) is the karaka, with its rich glossy leaves.

In the hills of both North and South Island are rich deposits of not only coal, but gold, silver, iron, manganese, and tin. Our geographies tell us the exports of these islands are wool, gold, and frozen meats. While our steamer is unloading a gas plant, rifles, shotguns, revolvers, and "ammunition sufficient for a brigade," to say nothing of lawn-mowers, reapers, wagon-wheels, coffee-mills, patent medicines and kerosene, all brought from San Francisco, we go over to the American consulate and ask our consul about New Zealand's exports. He says: While New Zealand is in approximately the same latitude south that Italy is north, yet the climate is like England's, and all crops of the temperate zone will grow here, with many tropical plants,—for the islands are well watered and have an abundance of rain. The official reports for recent years show the New Zealand exports to consist of twenty different articles, with an average total of 45 millions of dollars annually. The highest amounts for single articles are wool, $21,000,000; frozen meats, $6,500,000; gold, $5,500,000; kauri gum, $2,250,000; butter, $1,500,000; oats, $1,250,000; tallow, $1,250,000; and sheep, $900,000, annually. Over 77 per cent. of the exports go to Great Britain, less than 2 per cent. to the rest of Europe, 15 per cent. to the rest of Polynesia, Australia, Hong Kong and China, and 5 or 6 per cent. to the United States. At present New Zealand is exporting or selling 25 per cent. more than she imports or buys. She imports 24 million dollars' worth annually from Great Britain and two and one-half million from the United States. A little more than 7 per cent. of this country's imports come now from our nation, a large part of our sales being manufactured goods, as you see from your steamer's cargo now being unloaded.

"Places where New Zealand buys her goods at present rank as follows: Great Britain, New South Wales, Victoria, United States, Fiji, Queensland, Germany, China (including Hong Kong), Tasmania, South Australia, and France. You will see our nation stands fourth, and we are increasing the sale of American goods in this quarter rapidly.

"New Zealand is a great country, comprising more than 100,000 square miles with forty million acres of good tillable land, and she has 4000 miles of coast, with many good harbors. There is more land in New Zealand than in all our New England States, with New Jersey, Delaware, Maryland and District of Columbia thrown in to make good measure. All this land is found in North, South and Stewart islands, separated only by narrow

straits. Auckland, with her 60,000 people, is but one of several ports fast coming into close touch with the world's trade. Port Nicholson, port of entry for Wellington, the capital; Lyttelton, port of entry for Christ Church, on South Island, from which it is separated by a tunneled hill; Donedin, the port of the country's most important gold fields; Greymouth and Westport, the coal ports of South Island, and Invercargill with its port of entry, Bluff Harbor,— these are the leading commercial centers of New Zealand. Here, 1000 miles from Australia, 45 days from London, 25 days from San Francisco and 21 days from Honolulu, is the country that would be greatly benefitted by the opening of the Nicaragua or Panama canal. Auckland would be the first port of call and the last of departure between Europe and the South Pacific colonies, and freight rates would be greatly reduced."

The steamer's whistle told us her cargo was ready, and that in one hour we would depart. Thanking our consul for his information, we hurry on board and seek the hurricane deck while our vessel leaves harbor.

We see not only stately steamers of many nations, but steam ferries gliding this way and that, screaming tugs flying hither and thither, tall-masted sailing-vessels in line at the piers, and tiny rowboats darting in and out amidst the shipping of the bay. It is always a busy place, we are told, for Auckland is not only the port of call for the Oceanic line steamers, but it is the headquarters of the Northern Steamship Company, is constantly visited by boats of the Union Steamship Company and the New Zealand Shipping Company. Being the terminus of the steamers engaged in the Fiji trade and South Pacific island trade under the Union Steamship Company's flag, there are vessels of this line coming and going most of the time.

The dock facilities and spacious harbor of more than 110 acres we see fully taxed with all this shipping. While we stand looking at the lofty green-clad hill across the harbor that is known as Marine-Signal Hill, a friend calls our attention to the neat trim liner now crossing the bay toward the "swelling bosom of the great Southern ocean." We learn that it is the Moana, especially built for the San Francisco mail service. She is contracted to deliver the mails from San Francisco to Sydney in twenty days. We learn that her route is Sydney, Apia, Pago-Pago, Honolulu, San Francisco,— 5938 miles. On her trial trip in June, 1896, she made seventeen knots an hour with light draft, and she delivers mail both ways two days under contract time.

"Cast off" is now our call, and with an energy felt in every part of the ship our engines send our vessel steadily, smoothly through the harbor, past the breakwater, out into the ocean's rolling waves again. We steam up the coast, and as we round the north capes of land our vessel turns to the west and enters the New Zealand sea, which separates these islands from Australia. Her good harbors, clean estuaries, and navigable rivers, induce commerce, while her position, in easy reach of Australia, India, East India Islands, China and Japan on the one side and the United States, Mexico and South-American republics on the other, with the hundreds of fertile islands of Polynesia under her commercial sway, are destined to bring New Zealand into prominence in the world's commerce. When the American Yankee harnesses her Sutherland Falls, near the Milford Sound, it will surpass our own Niagara in generating power. These falls are found in a stream that springs from a glacier on Mount Jutoko, and the flow is very great at all seasons of the year. It is already a Mecca for travelers, as the wild country with such a rugged landscape forms a fitting background for this, the highest fall in the world,— 2000 feet capable of furnishing mechanical and electric power for all New Zealand.

We are now steaming through phosphorescent

water. When drawn up on deck and placed in a dark corner, agitation of the water produces scintillations of light. We are told that south of the fortieth parallel the waters of New Zealand sea are at night surpassingly beautiful. Vessels from Wellington to Hobart Town, Tasmania, pass through this region. On moonless nights the water seems to have given place to liquid fire. A shower-bath with this water sends scintillating particles all around one, making him feel warmer, whether he is or not. The microscope shows a drop of this water teeming with living and exceedingly active animalculæ,— so small, that were it not for the magnifying-glass we should never know of their existence.

After a journey of 1284 miles through this trackless sea, we reach Sydney, the metropolis of New South Wales, and the terminus of more than a dozen steamer lines, giving it commercial connection with leading seaports of the world. Botany bay, with its lake-like basin defended by the Sydney Heads,— two sentinel cliffs on either side of the entrance,— and with emerald islets luxuriant with semi-tropical vegetation here and there in the bay, is the pride of the city, and, together with Farm Cove,— an indentation around which semicircle lies the city's forty-acre botanical garden,— excites the admiration of all visitors.

Sydney we find has a first-class naval station, the headquarters of the British fleet in Australia. We pass near the trim, swift cruiser Mildura as we enter Port Jackson, and at the floating light turn south. There are usually from nine to eleven imperial war vessels on the station. The great stone quays and large substantial piers that now appear, mark the near approach to the city's water-front. We find Sydney to be a modern city about the size of Cleveland, Ohio. The city was founded in 1788, and named after the colonial secretary of state — Viscount Sydney. It became an incorporated city in 1842, and in 1855 a branch of the royal mint was established here. The University of Sydney is admirably situated, and has many fine buildings. It was the first university founded in the southern hemisphere. Here are also four large denominational colleges, a normal school, many public and private schools, besides a free museum, an art gallery, and a public library with more than 100,000 volumes. The city has always held high rank as a colonial city of Great Britain, on account of its complete system of charitable and educational organizations, substantial public buildings, and its enterprising, public-spirited citizens. As we stand on the wharf watching the stevedores unload the cargo that our steamer brought from San Francisco, we are surprised to see 400 tons of sewing-machines, 1000 barrels of kerosene, 1000 tons of wire, 800 tons of steel rails, 400 tons of roll paper, with hundreds of pianos and organs and miscellaneous articles taken from the hold and loaded on drays to transfer to the wholesale houses.

The hotels of Sydney are all run on the European plan, and are thoroughly modern in their equipment.

The next morning after our arrival we took train for Melbourne, where the present capital of the new Federal Government is located. At the head of a prolonged inlet of Port Jackson, here called the Parramatta river, we find the most noted orange district of New South Wales. The city that gathers this orange trade is Parramatta.

Our railway now divides, one branch going northwest through Bathhurst, the center of a great wheat region, to Fort Bourke on the Darling river; the other runs southwest to Melbourne. The direct distance between Sydney and Melbourne is 450 miles, but as the railway must cross the Blue Mountains and make a detour around the Australian Alps of Victoria, the distance by rail is nearly 600 miles. It is a double track all the way. As we near the foothills of the Blue Mountains, we observe ragged cliffs of considerable height, but crowned with forests; breaks in these

Alpine features form ragged valleys, well watered and quite fertile. The summits of the Blue Mountains rarely attain 4000 feet, and our railroad leads us through one of these valley passes to the interior, that is pictured in most geographies as a desert waste of sand and salty marches. We ride through this region many miles, and find that wherever the land has been cleared and irrigated it is remarkably fertile. The mountains of this continent skirt the coast; and the vast interior, not receiving the moisture that adapts it to agriculture, has scarcely been explored. Here are millions of acres covered with a low-growing bush, and termed "scrub." Russia has its steppes, America its prairies, and Australia its scrub — treeless tracts of upland. The vast western prairie region of our own country used to be called a desert. Now, this same region raises as good grain, fruit and vegetables as almost any other section of our country. So it may be with central Australia, now given up largely to the Negroid natives, who here live in their wild free state. The soil is fertile, irrigated farms along the border growing a great variety of temperate and semi-tropical plants. When it has been fully explored and occupied, central Australia may prove to be a great bread-basket for all this South Pacific region.

As we cross the line from New South Wales into Victoria land, we observe a complete change of train crew. At this division point, Prof. E. M. Shelton, an American educator who was called to this country by the British Government to establish agricultural colleges, enters our car. We ask him the significance of the change, and he says:

"Unlike our own country, the provinces or states own and operate their railroads. Before the Federal Government was organized, each state ran its line largely independent of all others. One might have standard gauge, another a narrow gauge. This prevented interchange of cars, and necessitated unloading and reloading freight, lessening profits to dealers and increasing the cost to consumers. New South Wales, the province you are just leaving, has nearly 3000 miles of railway and 50,000 miles of graveled, ballasted or corduroyed or bushed roads. She also has, to aid her commercial needs, nearly 14,000 miles of telegraph and many miles of tramway. All of these are under the direct supervision and management of the State Government. The revenues of this region come largely through its agricultural and mining resources, as but little manufacturing is done.

"New South Wales has 310,700 square miles of land. One-fourth of this is under forest, while in 1899 less than two per cent. was under crop. Yet this state has an overland trade of nearly fifty million dollars.

"The first effect of the Federal Government, which leaves the railways still under state control, will tend to make most of the railways in the continent a uniform gauge. Then you can load a car at Sydney and ship it over the entire mileage of the continent — 14,500 miles.

"Each state has officers and equips its own railways, and you see now the Victoria crew are taking charge of our train and will run us into Melbourne."

We here cross the river that forms the boundary between New South Wales and Victoria — the Murray. This river drains an area of half a million square miles, and is a thousand miles long. It overflows its banks periodically, at which time it rises from twenty-five to forty feet above its usual level. During its overflow period it is navigable within ninety miles of its source. It has many important tributaries, the most interesting one being the Darling river. At the point where our railway crosses the river, it is not more than 100 yards wide, and shows a tortuous channel which is characteristic of the river throughout its course.

The scenic part of Australia lies just before us.

It is the region of mountains whose rugged peaks and deep valleys make the European think of the Alps; hence they are called the Australian Alps. They contain the loftiest peaks in the continent; Kosciusko, 7176 feet, and Mt. Hotham, 6414 feet, being the highest summits in the range. Here are the very richest gold mines in Australia. While gold was first discovered in New South Wales in 1851, that same year this province was organized, and named for the queen. It has produced six times as much gold as any other colony. While mining engineers estimate that one-third of Victoria's twenty-three million acres are underlain with gold-bearing rock, less than one-tenth of this estimate has been developed. Victoria's wealth in minerals is remarkable, as not only gold, but silver, copper, tin, zinc, iron, lead, antimony, cobalt, bismuth, manganese, coal, sulphur, kaolin and bitumen are found in paying quantities, while rubies, sapphires, topaz, garnet and agate stones, to the value of many pounds sterling, have been obtained here. Her granite rivals the best granite found anywhere.

Our railway now threads a mountain-pass, and again we are on the coast plain which encircles the island continent, making 8000 miles of sea-front, whose retreating plain bears few indigenous plants; yet these few are peculiar in habit as well as in form, and grow in great quantities. The soil is adapted to cultivation, and, like our own nation, Australia is capable of growing all food crops required by man or beast. It is said that this island continent, with one-half its area in the torrid zone and one-half in the south temperate zone, can grow any plant in the world. We now pass through the Gippsland, the name given the region south of the Australian Alps.

While in the northern part of Victoria a quarter of a million acres are farmed by irrigation, here the breezes from the ocean supply an average rainfall of thirty inches. It is winter here, but the thermometer at the station just passed registered 45 degrees. The train porter tells us that July is their coldest month, but even then the temperature rarely falls below freezing, and the snow-plow is not used on their whole line of road, save in the mountain-pass through which we have just come.

We reach Melbourne too late for business hours, so we take a trolley-ride through its ten miles of suburbs. While Sydney is the oldest city, Melbourne is the largest city in Australia.

In 1835 a small colonizing party from Tasmania looked over the swamp and uncleared forest that fringed the Yarra, a short distance above its mouth, seeking a site for a commercial city. Some merchants in the company believed this river, navigable for large vessels, would afford good water transit, while the port harbor, afterwards called Port Phillip, would afford safe anchorage for ocean shipping, thus marking out the natural advantages for a commercial center. New South Wales in 1873 recognized the hamlet located by the Tasmanian colonists, and named the city Melbourne, in honor of Lord Melbourne, the British prime minister of that time. When gold was discovered in Australia, in 1851, the city numbered 23,000. In less than ten years (1857) our town of 23,000 became a great commercial port of 100,000, and known throughout the world. It has become the Chicago of Australia, unsurpassed by any colonial capital throughout the British possessions, for its palatial dwellings, broad avenues, public buildings, colossal warehouses, banks, theaters, schools, churches, and pleasure-grounds. For many years one-fifth of the revenue raised by taxation was expended for educational purposes.

The University of Melbourne, with other universities, together with libraries, museums, and art galleries, speak of the culture and refinement of this far-away capital, so freighted with commercial possibilities, so stirring with business life. Here we find a Chinese quarter, similar to the one in San Francisco. Yonder is Baseball Park, not

surpassed for utility and beauty by any in America, the home of baseball. Over there in a block by itself, 400 feet back from the avenue, is the public library building, whose interior arrangements are not surpassed by either the Boston Public Library or the Carnegie Library of Pittsburg, Pa. We find Collins Street to be the Michigan Avenue of this Australian Chicago, although Burke is a close second, with its well-paved streets and buildings of brick and stone, of modern design.

Melbourne has rail and coast connection with the rest of the continent, and steamer connection with nearly all lands. The city now has a half-million people.

We find a very serviceable ship railway that conveys ocean vessels from the Head of Port Phillip to an anchorage in Hobson's bay. This has been rendered necessary from the fact that sandbars obstruct the channel, so that ships drawing more than nine feet of water cannot get over the bars, while vessels drawing twenty-four feet of water can come up Port Phillip as far as Hobson's bay.

We learn at the custom-house that through this port of Victoria, seventy million dollars' worth is exported, and 1800 vessels, representing commerce from twenty-five countries, carrying nearly two and one-half million tons, enter port each year. A large part of the commerce is with Oceanica, and over one-third of the rest is with Great Britain. Our nation imported from Victoria 67½ thousand pounds sterling and exported to Victoria 883½ thousand pounds sterling in 1898.

The following morning we visit the foreign office of the Federal Government on matters of state, and find the minister a most affable, courteous officer, who thoroughly believes his country has a great future. From him we learn the following facts about the continent of Australia:

"This is the only continent lying wholly in the southern temperate zone, and its geographical position, surrounded by the Polynesian Islands, within access to both Oriental and Occidental ports of commerce upon the Pacific, it has a world commerce at its very doors.

"Australia is four-fifths the size of all Europe, while it has only one-seventh of the population of England alone, although its commercial activity is attracting merchants, miners, manufacturers, and farmers, thus rapidly increasing its population.

"Nature has given the continent a climate that is almost unequalled in any other continent, and any plant of temperate or tropical zone soon is acclimated and thrives here.

"The interior receives little moisture, but a nutritious grass covers the eastern part of this vast plateau region. Here is the great pasture-land of the continent. Australian wool has made Liverpool the largest woolen mart of commerce. While nearly one-fourth of the world's gold supply comes from this continent, yet the mineral products are but one-fifth as valuable as the agricultural and pastoral products.

"Railways, telegraphs and telephones are binding us more closely together as a people, and our new government, established January 1st, 1901, has brought 'The Commonwealth of Australia' into existence and given us a national life. On the above-mentioned date England yielded up all authority over our household matters, only reserving such maternal supervision as we are all glad to enjoy. Our Commonwealth consists of the six States of New South Wales, Victoria, Queensland, South Australia, Westralia (a new name for West Australia), and Tasmania. Some conception of their size may be gained when you know that Westralia is larger than all the United States east of the Mississippi and Ohio rivers. New South Wales equals the area of the States bordering your Great Lakes. Victoria would cover Minnesota, and Tasmania, West Virginia. Australia's population is not equal to the population of the United States in 1790.

"The features of the government consist of three departments, like your own — executive, legislative, and judicial. The executive is vested in the Governor-General, appointed by the British sovereign (who has, however, no active part in the administration), and cabinet. The cabinet, unlike the American, is chosen from Parliament to represent the majority sentiment in that body in the ministry. Whenever this policy is voted down they give place to a new cabinet, a successful principle long tried in English politics. The legislative department is vested in a Parliament, which consists of a Senate and a Chamber. The Senate consists of six members from each State, chosen by popular vote, to serve for a term of six years. The Chamber consists of seventy-two members, elected in the same way you elect Representatives to Congress, on the basis of population, for a term of three years. The Judiciary Department is similar to that of the former colonial courts, with power similar to your own federal courts.

"The federal capital is to be located in a tract ten miles square, under exclusive jurisdiction of the Federal Government, like your District of Columbia. This territory will be within New South Wales, but must be selected at least 100 miles from Sydney. Until the permanent capital shall be established, Parliament will sit at Melbourne. Each State controls the unoccupied public domain within its borders, and its legislature will also control and manage the lines of railroad within its borders, while the Federal Government operates the post-offices and the telegraph and telephone service of the republic."

We thank the minister for his courtesy, and return to Sydney by coast steamer, 560 miles. English, French, German, Japanese and American steamer lines connect Melbourne with the rest of the commercial centers of the world. Across Bass Strait lies the State of Tasmania, the Van Diemen's Land of the old-time geography. Its capital, Hobart Town, is on a bay in the southern part of the island, 450 miles south of Melbourne. Near this capital city, twenty miles inland, we are told, is a forest of remarkable gum-trees, similar in size to the big gum-trees of the Fernshaw mountain district of the Australian continent. Statistics tell us the largest tree known to man is a chestnut tree near the base of Mt. Ætna, Sicily. It measures 190 feet in circumference. The cypress tree near Oaxaca, Mexico, that Humboldt measured in 1855, is believed to be the oldest tree. He recorded a measurement of 126 feet in circumference and 382 feet between the outspread branches. The largest tree in the United States is found near Bear Creek, California. This tree measures 140 feet in circumference. One of the gum-trees of the Fernshaw district that had fallen was measured by a government survey, and its length was found to be 474 feet. The Tasmania gum-trees are fully as large, averaging from 300 to 400 feet in height throughout the forest, and many are found 80 feet in circumference. Fern trees are often found, with American native fruit trees, while fragrant yellow gorse and scarlet geraniums fringe the roads of Tasmania with almost impenetrable hedges.

We steam up the coast to Sydney, where we collect our gathered relics and select the steamer that shall take us on our journey northward to Asia. After consulting sailing-cards, prices, etc., we decide that the Nippon Yusen Kaisha, of the Japan Mail Steamship line, gives us just the route we want, and purchase a ticket to Kobe, first class, for £37 10*s*. The second cabin on the same steamer costs £26 10*s*. This steamer does not leave Melbourne until August 20th; arrives at Sydney on the 23d, and clears for Asia on the 29th. As it will be several days before we sail, we divide our time between the American consulate and the botanical gardens. At the gardens we see types of all the principal plants of the world; but the 10,000 native species of plants found in Australia, many of this number found nowhere

else, are of special interest to us. We notice that few fruits and edible roots and almost no cereals are found among these native plants. To see the leaves hanging vertically and trees shedding their bark instead of their leaves, seems as odd to us as it does to see stone-fruits with the stone on the outside instead of in the center of the fruit. The bottle tree with its "junk-bottle" trunk containing good water, the South Sea myrtle with its star-spangled blooms, the styphelia with its green flowers, the musk tree exhaling from leaf and bark a peculiar sweet odor, and the she-oak tree emitting a shrill wailing sound, though not a breath of wind stirs twig or leaf, are as peculiar to the plant world as the kangaroo, emu, bower bird and ornithorhynchus are to the animal world. More than 100 species of eucalypti (a member of the myrtle family) are found in the native plants. The acacias constitute the next largest family in the Australian plant list. This garden shows the kangaroo grass, that is so tall that it easily conceals a man on horseback. It also has an innumerable number of brilliant flowering plants, the giant lily being an object of great beauty.

Consul Bell informs us that for the twelve months closing June 30th, 1901, the United States exported to Oceanica 35½ million dollars' worth and imported 11¼ million dollars' worth of merchandise; our commerce with Australia being 12¼ million dollars greater than with the continent of Africa for the same period. He told us that statisticians declare the commerce of Great Britain and Ireland to be equal to about 20 pounds sterling per capita per annum. He has determined the commerce of Australia to be fully 40 pounds sterling per capita per annum, with almost unlimited resources before her.

He told us that Australia is to-day the greatest sheep- and wool-producing country in the world, having more than 100 million head of sheep. Nine-tenths of the wool is sent to Liverpool. The flocks can live in the open air the year round; the amount of rainfall alone determining the limit of pasturage. Within the last ten years Australia has developed meat refrigeration, and now (1901) surpasses all competitors in this industry. Ranchmen state that the cost of killing the sheep, freezing, shipping and selling the mutton in London does not exceed three to four cents per pound.

South Australia and Victoria raise the wheat for the continent, while they provide it also with grapes, raisins, and wine. Victoria leads in gold exports, having mined more than six times as much as any other colony since its discovery in 1851. New South Wales leads in silver, copper, iron, and coal. (The coal-fields are twice the area of the coal-beds of the British Isles.) Tasmania leads in the production of tin. The mineral wealth is very great, the agricultural and animal products quite large, but the manufacturing industries are yet in their infancy. Hence Australian exports are the products of her mines, farms, and pastures. She sends coal even to our Pacific coast, although the rich beds of coal lately opened in Washington will tend to lessen the sale of Australian coal in our Pacific States. The imports of the continent are largely the industrial articles manufactured in other lands, 80 per cent. being from Great Britain. Our consul tells us that while the coast and foreign trade of the Australian colonies was two and one-half million dollars in 1825, for the last few years it has amounted to more than one-half billion of dollars annually.

On the evening of the 28th we make ourselves at home in our staterooms, directly amidships in the N. Y. K. Australian liner Yawata Maru. We find that this liner is a new steel steamer that was built on the Clyde, under special survey to Lloyd's highest class, and fitted in accordance with the Japanese Government rules especially for the Australian service. Her commodious staterooms for first-class passengers have all the modern improvements, and are placed amidships on the upper deck, which admits of perfect ventilation, so essential in

tropical climates. Above, on the bridge deck, is the handsome dining-saloon, fitted with electric fans and lights. This steamer is a 4000-ton vessel, fitted with triple-expansion engines, and has a recorded average speed of fifteen knots an hour.

At 10 o'clock in the forenoon of the 31st we reach Moreton bay, the harbor of Brisbane, 500 miles north of Sydney. This bay is a sheet of water thirty miles long and six to eight miles wide, inclosed between two long sandy islands and the mainland. Hidden by the mangrove swamps skirting the coast is the mouth of the Brisbane river, and twenty-four miles up this river is the capital city of Queensland, surrounded by banana groves, cotton-fields, orange orchards and sugar plantations. The tulip tree, rosewood, sandalwood and satinwood trees adorn the streets of the capital city, while the palm supplants the eucalyptus tree.

Queensland practically supplies Australia with her bananas, while her great sugar plantations, which are mostly north of the tropic, yield more than 100,000 tons of sugar annually, and the increasing acreage of cane promises a much greater yield for the future.

After an exchange of cargo we steam up the east coast to our next port of call — Townsville, 750 miles northwest of Brisbane. This city is the coast terminus of a railway connecting the pastoral settlements of the better parts of the tableland interior with the foreign and coast markets through Townsville. Back from the coast a short distance, between Brisbane and Townsville, is a mountain of almost solid gold ore. This is Mt. Morgan mine, and is reported to be one of the very richest mines in the world.

We have been passing through the coral sea for several hundred miles. From near Great Sandy Island wending northward stretch the Great Barrier Reefs of Australia. This is said to be the greatest extent of coral reefs known to man. The passage between the reefs is dangerous at places, and at Cape Tribulation there is scarcely room for the safe passage of a vessel between the reef and the mainland. Farther north the reef stretches out again to sea, extending north across the east portion of Terres Strait. After three days' sailing we reach Thursday Island, off the northern point of the Cape York peninsula.

While our ship is preparing for its eight days' run to Manila, we take a stroll over the island. To the south is the continent we have just left. To the north lies the second largest island on the globe — New Guinea, which is larger than Texas, our country's largest State, by many thousand square miles. Seventy thousand square miles in the northern section of the southeastern part of the island is now called Kaiser Wilhelm's Land, and has been a colony of Germany since 1884. The southern section of the southeastern part — 90,000 square miles — was declared under British protection in 1885, and became a colony of Great Britain in 1888. The rest of the island is a colony of Holland. The island is about 360 miles wide and 1300 miles lang. Its natives are Papuans, the most barbarous savages in the Pacific. This island, together with the groups of small islands that lie to the southeast and east of New Guinea inhabited by Papuans, marks Malanesia, a name meaning "islands of the blacks."

A growing commerce with the mother countries and with Queensland and New South Wales is developing prosperous trading stations and establishing plantations which are worked by the Oriental laborers acclimated to the heat of the tropics.

On our stroll we were fortunate enough to get acquainted with Mr. James Clark, who owns and operates a pearl farm of 5089 square miles, situated on the strait at the northern extremity of the York peninsula. In the Orient he is known as "the king of the pearl-fishers." In answer to our questions he said that he had been engaged in pearl-fishing for ten years. With proper intelligence in the selection of a place, Mr. Clark said one can raise pearls and pearl-shells as easily as he can

common oysters. In 1897 he stocked his farm with 150,000 pearl oysters, obtained in many instances far out at sea. His experience has taught him that shells attain the greatest size in shallow water. He ships his pearls to London in his own vessels. He employs 1500 men (250 being divers) and 250 vessels to harvest his crop of pearls. Each year's catch runs from $250,000 worth to five times that amount. Surely, we said, this is the queerest "farming" we have yet heard of. Mr. Clark smiled, and told us that quite a number of smaller but successful farms were being "worked" across in New Guinea.

The long blast of our whistle calls us aboard, and, bidding the pearl-king good-by, we hurry on deck. We now enter the East-Indian Archipelago, that wonderful system of islands, the home of volcanoes, earthquakes, typhoons and monsoons,—yet a great storehouse of spices, tropical fruits, vegetable drugs and minerals for all nations. Here is the home of the Malay, that peculiar brown people who work only enough to keep them from starving, get along with as little clothing as possible, and take their food largely as nature provides it for them. This region has been their home for more than 2000 years.

We steam through the group of islands in the Banda sea, and notice their shores fringed with cocoanut palms and dense jungles of luxuriant tropical vegetation. Here the nutmeg and mace of commerce grow in abundance. The kernel of the fruit is the nutmeg and the outside covering of the fruit forms the mace.

As our vessel goes through the Molucca Pass we see what seem to be great hop-yards on the islands. Our friend informs us that these are pepper vineyards. The vines are planted beside stumps or trained upon poles stuck upright in the ground. The vines begin to bear during the third year, and sometimes yield two crops a year, a single plant often producing a pound of pepper at each crop. Some of the berries are picked while green, and when drying turn black. This constitutes the black pepper of commerce. When the fruit is ripe the white pepper is obtained. When picked the berry is fiery red in color, but when soaked in water this red skin falls off and leaves the white pepper of commerce. Hence black pepper and white pepper can both be obtained from the same plant.

We now leave the land of the Southern Cross, pass through the phosphorescent waters of the Archipelago "across the line" into the Northern Hemisphere, ruled by the North Star and its circumpolar constellations. Here at the equator, in the "summer seas," the sun rises and sets at the same hour each day, all the year round; the trees are always green, and filled with thousands of birds of many different hues and carols of song. Flowers are ever in bloom, and it is Fourth-of-July weather the whole year through.

Commercial statistics show us that we have but a small portion of the East India supplies, yet in 1900 they sent us seventy-three million dollars' worth of imports; thirty million dollars' worth of food products; tin, ten million; drugs, chemicals and dyes, six million; and the rest constituted a miscellaneous cargo.

On September 12th we reach the pearl fisheries of the Sulu Islands, the southern part of the largest island group in the Archipelago,—the Philippines. These islands extend in a long line through twenty degrees of longitude, and comprise 2000 islands, great and small. The islands are of volcanic origin, and vary from a few miles to 41,000 square miles in area, while the total for the group approximates the area of New England, Delaware, New Jersey, and Ohio.

On the morning of the 14th we steam past Corregidor and enter the bay of Manila, famous as the scene of the greatest naval victory of modern times. As we pass over the placid waters of the bay whose shipping now brings to its capital city the commerce of many lands, we instinctively re-

A Public Laundry and Bath, Manila, P. I.

peat the lines of the prairie poet of our Central States, dedicated to the battle of Manila:

"O Dewey was the morning
Upon the first of May,
And Dewey was the Admiral
Down in Manila Bay;
And Dewey were the Regent's eyes,
Those heavenly orbs of blue.
And do we feel discouraged?
We do not think we 'dew.'"

Our steamer is to stay twenty-four hours at the port of Manila, and we go on shore to hear our national hymn sung by the Filipino school-children in their native tongue, as well as in English, and, best of all, to again walk under the Stars and Stripes. The city of Manila is becoming a great commercial center, with a rapidly growing commerce. It has just come through the Spanish-American and insurgents' wars, of which it was the center, well-nigh destroying its commerce; yet this city in 1900 exported to the United States alone, five million dollars' worth of hemp and fifty million pounds of sugar. Iloilo and Cebu are important seaport towns. We find that in the Philippines, as in nearly all other points of the Malay Archipelago, Chinese traders do a large share of the wholesale, retail and banking business. While the whites numbered in 1900 but 25,000, exclusive of American soldiers, the Chinese numbered 50,000, the majority of whom were in mercantile business of some kind. The natives are divided into eighty tribes, speaking as many dialects, and number between eight and ten million souls. They are quick to learn, are generally more energetic than their Malay cousins of the other island groups, and are proving themselves desirous of acquiring the advantages of modern civilization. Manila, as the metropolis of the islands, has an advantageous location, and is now a city of 200,000.

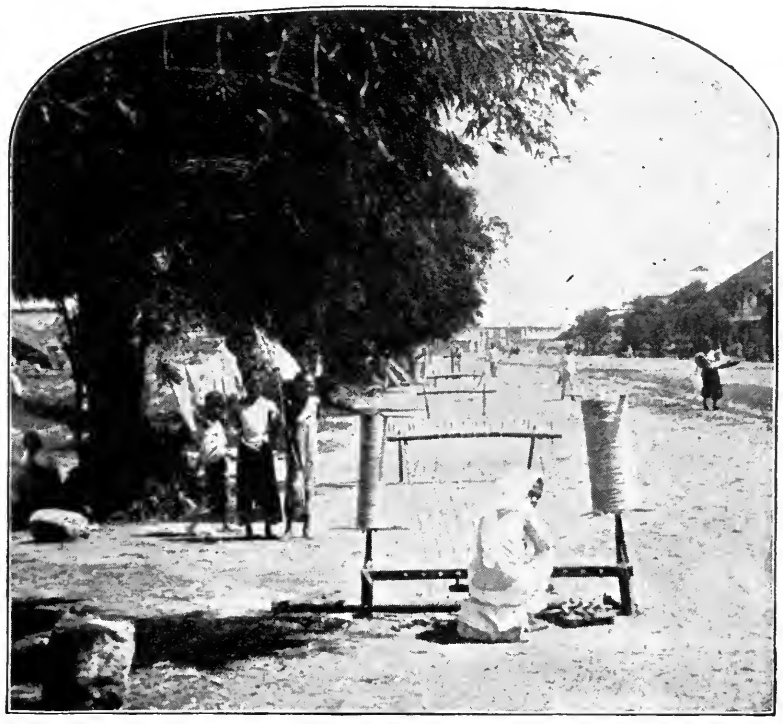
At the custom-house we learn that the exports are chiefly Manila hemp, sugar, copra (dried co-

Looking toward the City from the Lighthouse,—Pasig River Entrance, Manila, P. I.

coanut), tobacco, and rice. The first-named article comprises nearly one-third the value of all the exports, Great Britain and the United States purchasing the entire exported crop.

The most important imports are ginghams, fruits, yarns, ironware, coal, and petroleum. The bulk of the trade is with Great Britain, Germany, Spain, America, and Japan. Manufacturing plants are being established to work up the hemp, silk and cotton fabrics, and make furniture and agricultural implements.

Manila is a port of call for many American, Asiatic and European transpacific steamer lines, and is connected with Hong Kong by cable. Telegraphs and railways are being built to facilitate commerce in all parts of the larger islands. The chief occupation is agriculture, yet less than one-tenth of the land is under cultivation, and that very imperfectly tilled.



Making the famous "Manila" Rope, in Manila, P. I.

Drying Hemp on the Island of Cebu,—the principal export of the Philippines.

Forests of the finest cabinet woods are found on the islands. Very little is known of its mineral wealth, although gold is reported in Luzon, and coal, petroleum, lead, copper and sulphur have been found on the other islands.

The custom-house officials at Manila predict a fifty-million-dollar commerce for 1901 in the Philippines, with good prospects to soon double that amount.

The strife in the islands has given way to peaceful pursuits, while the establishment of American schools and a stable government gives promise of protection to business interests; hence capital is being invested in industries and institutions that promise good to our far-away island friends.

Delights of Oriental Farming.—Preparing ground for Rice, the Filipinos' "Staff of Life."

port's expanding commerce. Through this port China sends one-fourth of her exports and receives one-third of her imports.

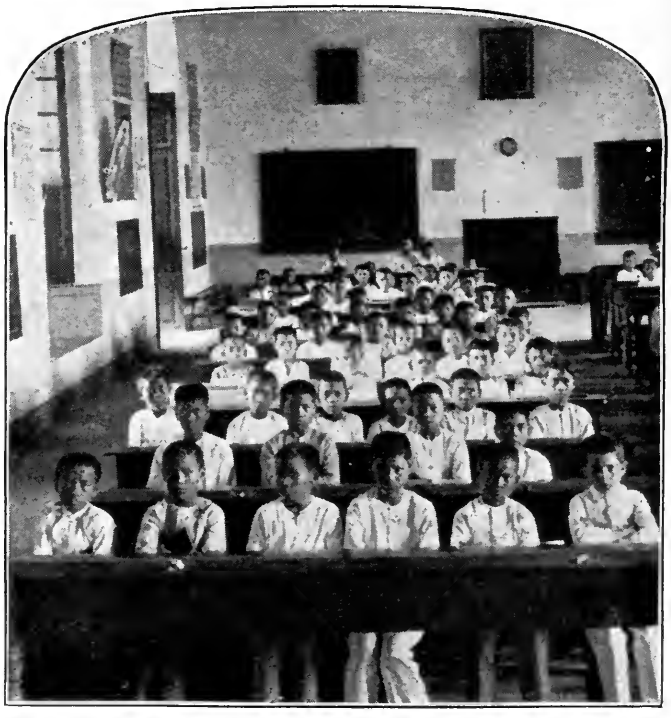
Our N. Y. K. steamer now heads northward, toward the island empire of Japan.

On the morning of the 24th we reach the "gate through which the Western civilization first flowed into Japan"—Nagasaki. This is the first port of entry for vessels coming to, and the last port of call for vessels going from, Japan. It lies at the head of an inlet three miles long and from one-half to a mile wide.

We see the process of coaling a vessel in the harbor, which to Americans is a very interesting sight, as our people use labor-saving machinery largely for this work. The vessel coaled was the "Gaelic," of the O. & O. line, plying between Japan and San

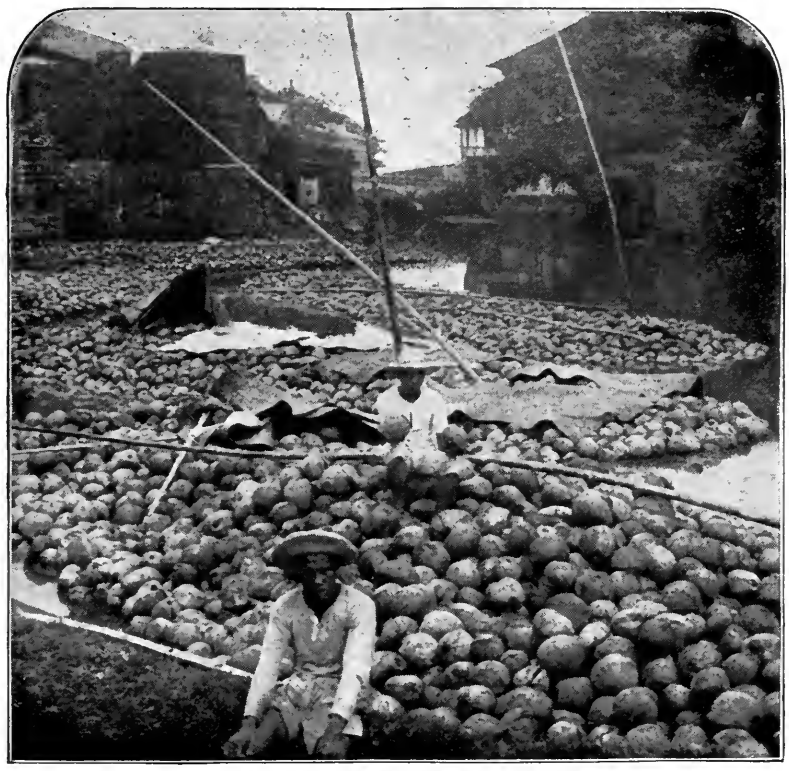
At ten o'clock next morning the Yawata Maru is under way again. We go out past the old fort of Cavite, whose Spanish guns tried in vain to wreck the American fleet in the battle on the bay.

We enter the China sea, and on the 18th reach the great English center of Chinese commerce — Hong Kong, 650 miles northeast of Manila. Hong Kong is an island eight miles long, lying off the south China coast. It was acquired by Great Britain from the Chinese in 1841, and in 1842 the present port of Victoria was established and made an English military and naval station. It has since become the great clearing-house of Oriental and Occidental trade. Our consul tells us that the annual tonnage of commerce often surpasses $14\frac{3}{4}$ million tons. So great has this commerce become that England in 1898 was forced to lease of China 400 square miles of land and water territory surrounding Hong Kong, to provide anchorage, dockage, and proper defense to the



The right way to Filipino Freedom.—Boys in Normal High School, Manila, P. I.

Francisco. The ship we see surrounded by boats of many kinds, shapes and sizes, called lighters. These are loaded with coal and workmen. Staging is extended from the lighters to the ship's deck. Now men go below in the hold of the steamer to "trim" or compactly store the coal; women form lines and pass it up in baskets which hold from ten to twelve pounds, throwing the empty baskets into the lighter boats to be gathered up by children, who also assist in filling them up. In this way these Japanese men, women and children constitute a human elevator, and in the course of six or eight hours store 1200 tons in the coal-bins of the Gaelic. We learn that for this work the women are paid at the rate of nine cents and the men thirteen cents a day.



Rafts of Cocoanuts on one of the Waterways of Manila.

We find at Nagasaki a dry-dock cut out of the solid rock, costing more than a million dollars and available for Japan's largest ships. Here also we find large engineering works and shipbuilding yards. It is here that Siberian and Korean passengers from the west and south generally change steamer.

Our ticket reads to Kobe, and, as good steamer connections can there be made, we will continue our voyage on the N. Y. K. steamer to that point. After leaving Nagasaki our steamer moves up the western coast of the Kiushu island to the Straits of Shimonoseki, 148 miles. This is the opening to the inland sea. The seven forts of Shimonoseki guard this passage with the most powerful modern artillery. Here was concluded the treaty of peace that closed the China-Japanese war of 1894–5, giving Japan the island of Formosa, noted as the camphor island of the world.

We have seen many beautiful places on this Pacific voyage, but as we sail through this inland sea, from eight to forty miles wide and 240 miles long, it impresses us as surprisingly like a fairy land. The sea seems studded with islands of almost every conceivable shape, from the barren rocky islet to the island of emerald green, artificially terraced to its summit. It is not definitely known how many of these little islands break the continuity of this watery blue, but surely they number in the thousands. The islands are not generally wooded, and many are mountainous. The intricate channel often passes within a stone's-throw of the shore, and between some of the islands has a current of four to six knots an hour.

September 26th we reach Kobe, our destination, "the brightest and healthiest of all the foreign settlements in the empire," we are told.

As we come down the gang-plank from the

Looking northeast over the Bay, from the New Market, Hong Kong, China.

Yawata Maru we notice the funny two-wheeled carts in a line, each with an almond-eyed Japanese wearing a stiff round hat covered with blue cotton, about the shape and size of a small butter-bowl upside down. He also wears a loose-fitting shirt fastened with a knotted sash, and a pair of tights. This is the jinrikisha man waiting to be hired. We observe that each man stands by his vehicle and motions to his legs and then to his jinrikisha, as much as to say, "Try my speed." These are the cabs of Japan, and after going through the custom-house we hire our human steeds for ten cents an hour, and see the sights of this Japanese city of 160,000 people.

We learn that this port was open to foreign trade in 1868, and ten years later its imports and exports aggregated 12½ million yen as against 40½ million yen for Yokohama, the chief commercial port of the empire. In 1897 Yokohama's commerce was 177½ million yen, with Kobe a close second — 162 million yen. This port is the center of the tea trade, and is connected by rail with the many commercial cities on the island of Hondo.

Just a little to the south and east lies the ancient military capital of the sixteenth century, now the second city of the empire in population, but the ranking city in manufactures, where 60,000 hands are employed. The detail plan of harbor construction now being carried on involves the expenditure of twenty million yen, and will probably make Osaka the shipping as well as commercial capital of Japan.

To the north, thirty miles inland, is Kyoto (meaning capital). This city was founded in 793, A. D., and for many centuries was the imperial, intellectual, political, religious and artistic metropolis of the empire. The city is the third city of Japan, and its people make the fine porcelain and weave and dye the beautiful silk fabrics that find such a ready market in Europe and America.

To the northwest is the treaty port, with its expansive harbor, that Perry opened to the world in 1854 — Yokohama, in the center of the empire's most extensive silk district.

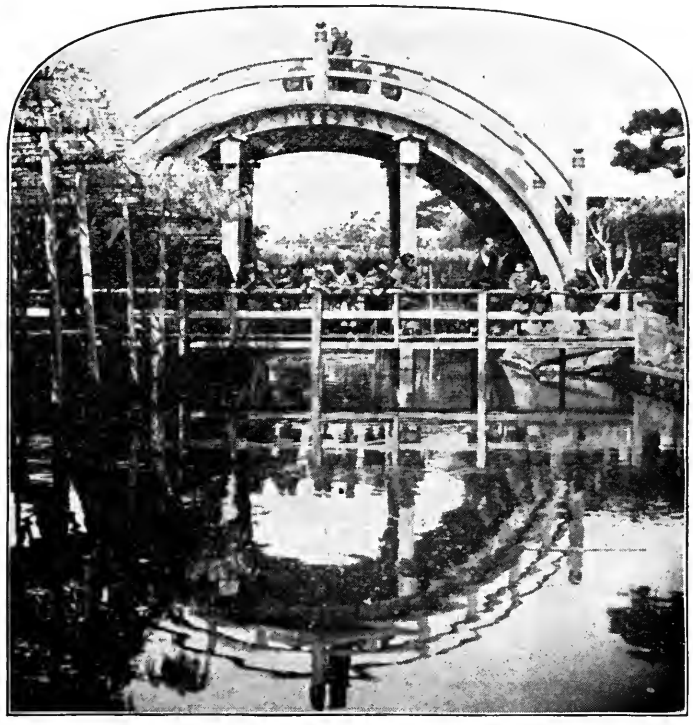
Fifty minutes ride from the latter place is the present capital — Tokyo (west capital), a city about the size of our own Chicago.

These facts we learn from an American tourist who accompanied us on our trip around Kobe and vicinity. He wanted us to ascend the sacred mountain, an extinct volcano—Fusiyama (*foo-zi-a-ma*), situated near the central part of Hondo, and more than two miles high. But we feel that we cannot spare the time, and, returning to the consulate, he aids us to get our necessary passports for crossing Asia.

We find a steamer of the N. Y. K. line will clear port in two hours for Vladivostok. We pay 54

yen ($27) for our ticket, and at the wharf seek our steamer for Siberia.

We find at their respective piers on the water-front, vessels carrying the flags of twenty-one steamer lines, but the white flag with two parallel red stripes across the center marks the location of the N. Y. K. steamers. Here we find the vessel that is to take us across the sea of Japan to the mainland. It is a modern vessel in all its equipments, heated by steam and lighted by electricity. The "clack! clack!" on the wharf causes us to determine what makes the noise. We find that the Japanese have blocks of wood about three inches high fastened to the bottoms of their sandals, to keep their feet dry. Their rain-coats are made of rice straw and their umbrellas of paper. On a rainy day like this one, the natives of the whole city are three inches taller. We now



A Semicircular Bridge in quaint old Japan.

Bamboo Avenue, Kyoto, Japan.

thread our way back through "Fairyland," and, after coaling at Moji, cross the sea to the mainland.

Our steamer first stops at Fusan, to deliver a cargo of cotton yarn to the Koreans and take on food products. The eggs were brought in crates of so many "sticks" instead of so many dozen. Ten eggs are placed in a long row, and straw is put all around them. Then the straw is securely tied between the eggs, making the egg-stick. These Koreans formerly constituted a very secluded people, and were known in the commercial world as "The Hermit Nation." Since the Chinese-Japanese war, Korea is developing a very extensive commerce with her neighbors, Japan, China, and Siberia. American machinery is developing her gold mines, and railroads connect her seaport towns with the interior so her agricultural products can reach the seacoast.

Fusiyama, the great Sacred Mountain of Japan.

Across the peninsula from Gensan — our next port of call — is the principal seaport of Korea, Chemulpo. Into the harbor of this city our own Commodore Stenfeldt brought his vessel in 1882, and succeeded in negotiating a treaty with the King of Korea that opened his land to the commerce of the world. The land of Korea is about the shape of Florida and the size of Kansas. The harbor of Gensan is a commodious one, and we observe that the city is composed of one-story houses, mostly built of mud and covered with straw-thatched roofs. The principal business of the citizens, as Mr. Carpenter has well said of the Seoul natives, "seems to be to smoke, to squat, and to eat."

We now steam northward, cross the fortieth degree north latitude, and after two days of boisterous seas enter the Gulf of St. Peter the Great. In a few hours we reach the wharf, and, saying "Sayouara" (farewell) to our Japanese sailors and friends of the Yawata Maru, descend the gang-plank. Our Pacific voyage of nearly 14,400 miles is ended, and we are in the great seaport of Russian Asia, one of the most strongly fortified cities of the globe — Vladivostok.

Across the Eastern Continent by Rail.

Our last chapter left us at Vladivostok. We reached this port October 5, and went at once to police headquarters. Here our passports were critically examined and we were asked many questions. The result of the conference was that we were all provided with permits from the chief of police, giving us the privilege of purchasing tickets for St. Petersburg via the Trans-Siberian Railroad. We now go out to find the railway station, purchase our tickets, get a time table, and to plan for the long ride.

After zigzagging over the city we at last reach a building that looks like an American railroad depot, and here we learn, through a Russian soldier who speaks English, how to proceed.

After considerable trouble we all secure our tickets, buying through tickets to St. Petersburg, for which we pay 250 rubles ($125) for first-class tickets. Here are sold three classes of tickets; the second class costs 170 rubles, and the third class 90 rubles. At Russian points along the railroad a fourth-class or land-seeker's ticket is sold to any Siberian points. For all places west of Tobolsk the fare is but two rubles. For any station east of that, even to Vladivostok, the fourth-class passenger pays but four and a half rubles. The Government of Russia in this way is inducing peasant farmers to enter Siberia and help develop her agricultural resources. Within three years from the date upon which these tickets were first put on sale, 600,000 peasant families entered Siberia's great agricultural region, that

comprises more than 425,000 square miles of tillable land, at least 25 per cent. of which is a rich black loam, well adapted to wheat.

The station-master tells us the Chabarovska express, with mail and passengers for Moscow and St. Petersburg, leaves at 9:25 each morning. We receipt our baggage, secure a drosky (the Russian carriage), and explore the city.

Our driver fortunately can understand English, and though speaking our tongue in a very broken manner, yet it is intelligible. The long beards, fur caps, and thick fur coats reaching to the tops of high boots, mark the Russian citizens.

The streets and houses are similar to those of an American town. The houses are substantial buildings of wood, stone, and brick. The city is built on hills sloping toward the harbor. At the top of one hill we alight and observe the picture spread out before us. On the slopes of the hills is Vladivostok — a bit of Russia let down by the Pacific, a city of nearly 30,000 people. To the right and left are the harbor forts in whose barracks are thousands of soldiers. At anchor in the bay are Japanese, German, Norwegian, English, and American merchantmen, as well as Russian. We later learn that since the completion of the Ussuri Railway the government has made such rates for merchandise from this port to the Amur river that commerce has been attracted, and the port is now doing a good commercial business.

Formerly the port was closed to navigation five months of the year by the ice in the harbor. The government has fitted up powerful ice-breaking steamers to keep her ports free from ice. Our driver informed us that one of these steamers, the Ermack, is now in the shipyard being repaired and made ready for her winter's work.

At our request he drives us to the American consulate. Our commercial agent, Mr. R. T. Greener, secures the necessary permit and takes us through the Russian dockyards to where the Ermack is being fitted for her energetic work. He informed us that this vessel was made by shipbuilders at Newcastle-on-Tyne, and was launched in 1898. The vessel is 305 feet long, 71 feet wide, and 42½ feet deep. It has a displacement of 8000 tons; its propelling machinery is divided into four sets, and has a combined force of 10,000 horse-power. The hull has 48 water-tight compartments, that have been subjected to the severest test. Mr. Greener called our attention to the fact that the bow is cut away, and the exceedingly low overhang serves the double purpose of breaking the ice with which it comes in contact and of protecting the forward propeller. This ice-breaker by its forward propeller disturbs the water under the ice, which deprives it of its support, and then the force of the heavy vessel breaks through it, oftentimes with a roar like the bursting of an ice-gorge. Admiral Makaroff, who designed this vessel, arranged for its powerful screw to point upward and to revolve rapidly in a horizontal plane ahead of the cutwater and under the ice. This is the secret of her great success as an ice-breaker. The upward pressure of the water from the rapidly rotating wheels cracks the ice, which the large steel bows then force asunder. In March, 1899, the Ermack forced her way through 200 miles of ice. The last fifty miles of the trip the ice was ten feet thick. She hurled huge blocks of ice to the right and left as easily as the modern locomotive plow hurls the snow. The Ermack cut through the last nine miles of that ice wall in one hour. By use of these ice-breakers Russia can keep her Baltic, White, and Kara seas, as well as Vladivostok, open to commerce twelve months instead of seven months in the year.

As we returned to the consulate Mr. Greener told us that the United States has direct communication with this port through New York, San Francisco, Portland (Ore.), and the Puget Sound ports. Most of the ties for the Manchurian Railway came from our Pacific coast, while a large per cent. of the steel rails and the rolling-stock

Sacred to the "Son of Heaven."—Grand Throne in the Emperor's Palace, Forbidden City, Peking, China.

of the Trans-Siberian are from American steel-works, car- and locomotive-shops, sent via New York.

You will find American track-laying machinery, American civil engineers, and, on many trains, American locomotive engineers.

We find no one at the hotel who can speak English, so we are forced to use the "sign language" to make our wants known. We resolve to conquer Russian before we leave the bounds of the empire.

The next morning we start on our trip across the Euro-Asia continent. Our train is similar to American trains, with library, sleeping, dining and observatory cars. We find the dining-car service good and charges very reasonable.

Our route lies along the Ussuri river from Nikolskoe to the Amur, at Chabarovska. This is 482 miles from Vladivostok, and the road is locally known as the Ussuri Railway. We are told that this division of the transcontinental line was completed in 1897.

At Nikolskoe we observe a division of the road running off to the northeast. This we learn to be a branch of the Eastern Chinese Railway, connecting with the main line at Harbin, on the Sungaria.

The main line of the Eastern Chinese Railway is now being built from the Onon Station, near Stretenska, on the central division of the Siberian Railway, to Port Arthur.

From Niuchwang, a station north of Port Arthur, a branch runs around the Gulf of Pechili, connecting Tientsin, Taku and Peking with the Eastern Railway.

The section from Tientsin to Peking was destroyed by the Boxers in 1900. The main line of the Eastern Railway through Manchuria was begun at the Port Arthur end, and more than 500 miles of the 945 miles of the road within Chinese territory was completed before the Boxer troubles of 1900 stopped progress on this road. The road from Tsitsika to Onon is yet to be built. The total length of this division, Onon to Port Arthur, is 1920 versts (1273 miles). When completed, this Manchurian road will shorten the Siberian Railway 514 versts (341 miles).

We notice that each station-house on this line of road is different either in shape or color from its immediate predecessor, and is a neat, trim building, ornamental as well as useful. This is a characteristic feature of the entire line of road.

The business on the Ussuri division has increased remarkably since the line was opened, and

is now doing a heavy freight as well as a satisfactory passenger traffic.

We reach Chabarovska twenty-eight hours after starting, and are transferred to the Marine department of the Siberian road.

This route of the main line from Stretenska to Chabarovska involves so much expense, and building the road means so many technical difficulties, the construction of this section has been deferred. The Chinese Eastern Railway Company has been organized, and encouraged to immediately construct the Manchurian branch line heretofore spoken of. In the meantime the government has made use of the Amur and Shilka rivers as the transporting link between the two sections of completed railway.

We are fortunate in getting passage on the "Amgoon." This is a side-wheel steamer, 160 feet long, with compound surface condensing engines of 600 horse-power with two locomotive wood-burning boilers. It is one of the best of the 108 steamers used by the Marine department of the road.

Huge steel barges over 200 feet long, having a capacity of 400 tons and a draught of 3½ feet of water, are drawn by the steamers, which increases their freight-carrying capacity at a minimum of expense. These vessels convey construction material for the road as well as miscellaneous freight.

The steamers now have regular runs on schedule time from Chabarovska to Stretenska, the east-end terminus of the middle section of the road and head of navigation on the Shilka river, a distance of 1423 English miles.

As we pass along we notice buoys, and learn that the river Amur has been buoyed as far as navigable, to indicate to the pilot the best channel. To further assist navigation, stations have been established along the river, where daily records are kept of the depth of water, and placarded so the pilot can read them as he passes along.

Though we reach the Amur more than 500 miles from its mouth, we notice that the river is wider than our great Father of Waters at any place in its entire course. The Amur here is a mile and a half wide. As we go up the river we find its current is so strong that the trip up requires nearly twice as many days as it does to come down. An English traveler who passed over the route in the spring told us that his boat came down in eight days, while our schedule reads fourteen days for the run up-stream.

This river for hundreds of miles has not a cultivated field, and the only objects that show the presence of man are the piles of wood on the bank, fuel for the steamers.

When we reach one of these piles our steamer loads, and most of the passengers go on shore, exploring the deep and lonely woods. So long does it take the Russian crew to load the fuel that sometimes the steamer-women wash and dry their clothes before the whistle calls "All aboard."

We find that commerce on the river is establishing hamlets at the "woodpiles," and these are sending colonial settlements into the interior. In this way, this immense river basin, apparently fertile and seemingly habitable, will eventually know the plow and the harvest.

This river is navigable for more than 1500 miles, and drains a greater territory than any river in Europe or North America save the Mississippi alone. We find the port of Blagovestchensk to be a commercial city of nearly 50,000, whose river-front extends from six to seven miles. It has large general wholesale and retail shops, built of brick, with ample rooms, lighted with electricity. Not only Russian but German and French merchants are doing a profitable business at this large trade center, whose trade territory reaches nearly to the Sea of Okhotsk.

Eleven hundred miles from the Ussuri Railway station the "Amgoon" pilot turns our vessel to the right, up the Shilka, a navigable tributary of the Amur. We follow this river to its head of

navigation, where we find Stretenska, a city of many thousands. We reach this eastern terminus of the Central Siberian road October 25, and entering the train are soon whirling westward. This part of the road is 750 miles long, terminating at Muissov, on the eastern shore of Lake Baikal.

We find Onon an important commercial point, destined to be a railroad center when the Manchurian road is completed. Nerchinsk is in a rich mining district, which makes it an important trade center.

At Chita one of the party learns that our engineer is an American, and is invited to ride over the Yablonoi mountain range in the cab. From the engineer he learns that the rails have been found too light for quick traveling, and engineers are forbidden more than twenty miles speed per hour; the average time being from twelve to fifteen miles. From him it is learned that the Government intends to replace all wooden bridges (over 1400 in number) with iron or steel structures, to replace the light rails with heavy steel rails, and thoroughly ballast the entire system of road. Then, the schedule for passenger trains is to be raised from thirteen to thirty-three miles per hour.

The road was begun in 1891 and contracted to be open to the Pacific by 1905. Through the boat service on the Amur, the road has been doing a through transcontinental business for some time, but at the present rate of construction, all-rail connection will be made by January 1, 1903, save the Lake Baikal cut-off. Here the mountains come so close to the shore of the lake that this short stretch of road would cost at least twelve and one-half million dollars. For this reason, train ferries run us across the lake. At Mussiov our entire train is run upon large steam ferries like those so common at Detroit, and we follow the path cut by the large ice-breaking steamer, similar in design and action to the one we saw at Vladivostok.

We find Lake Baikal is a very large body of water, with extensive and profitable fishing industries. This is one of the few lakes of the world with fresh-water seals. Sturgeon and salmon are found in paying quantities, the principal salmon fisheries being located on the Angora river and sturgeon fisheries on the Selenga river, that enters the lake from the southeast. The fishing industry is valued at 300,000 rubles per annum. This lake is the center of an earthquake region, and the sudden and fearful storms that occur on the lake force its navigators to always be on the alert. The lake is drained by a tributary of the Yenisei, is about 375 miles long, and where our ferry crosses it is forty miles wide. The lake would cover all of Maryland, with Rhode Island thrown in. From the ferry we can see sledges on the caravan route crossing the ice. This route brings down the choice squirrels, sable, otter, and ermine skins from northern Siberia to the Irkutsk exchange. The very choicest of the world's furs come from Siberia, and this is one of the greatest fur-trade routes in central Siberia.

Away to the south lies snow-clad Khar-ma-Davan, whose summit rises more than a mile above the level of this lake, which is nearly twice the altitude of Lake Superior.

Although it is only October 29, we are sure no winter weather in New England has a greater per cent. of cold to the square inch than that which we experience in our trip across the lake. Spirit thermometers are the only kind used in this region in winter. We are told that even the ice-breaker, which was transported in sections and put together on the lake for the purpose of keeping the lake open to ferries, was forced to remain at the Irkutsk dock two months of the last winter's season. The cold storms made it impossible for the men to be at their post long at a time. The uncertainty of the weather on the lake is a serious obstacle to winter transportation. Although the Tunka Alps reach to the very lake-shore on the

south, the uninterrupted transportation demands the building of the fifty miles of railway around the southern shore of the lake to Muissov. This is locally called the Kroogo-Baikal line. (Kroogo means circuit.)

After four hours on the stormy inland sea, we run into the station at Irkutsk. Here is the end of the western division, and we find the city a great industrial and caravan center as well as the center of a rich mining district. Here are rich mines of jasper, graphite, serpentine, lead, silver, and gold. Rich layers of coal and iron are found at more than fifty places along this transcontinental road.

While Siberia furnishes two-thirds of Russia's output of gold, very little but placer mining for gold has been attempted, on account of lack of machinery for quartz mining.

Yakutsk province, lying to the northeast, with its intense cold, covers an area very nearly equal to all the mining area of our nation (exclusive of Alaska), and is reported exceedingly rich in mineral wealth. The Stanovoi mountains, that mark its eastern boundary, have already revealed its rich ores of silver and lead.

This city of Irkutsk is the second city of Siberia, and is now the commercial emporium between the Chinese Empire and Russia. Some years ago the city of Kiakhta was the center of a very large caravan trade. It is 100 miles to the southeast, on the border, less than a half-mile from the Chinese village of Maimachin. Free interchange of goods was established between China and Russia at this point in 1727. Before the treaty of 1860 opened the whole Siberian frontier, the trade of this caravan center often amounted to sixteen million rubles per year. Irkutsk, on the lake-and-rail routes, is now the terminus of the caravan tea trade from China, and Kiakhta has lost its prestige,— although it still is an important trade center. Each year Irkutsk holds a June fair, where Chinese merchants barter their tea, fruits, porcelain, silk, etc., for furs, metals, and European goods.

The Siberian Railway is rapidly displacing one of the greatest caravan routes in the world, that reaches from Moscow through Tomsk, Irkutsk, Kiakhta, Maimachin to Peking. This route in its palmiest days employed from 15,000 to 16,000 men, 75,000 to 80,000 beasts of burden, and transported over 60,000 tons of freight. It required six months to make one trip. Now, Irkutsk instead of Moscow is the terminus of the greater part of the trade. The caravans at this time of year consist of sledges drawn by dogs, while the northern caravans use reindeer with the sledges.

Irkutsk is now connected with St. Petersburg by the Siberian Railway, that runs daily trains with three classes of carriages. Besides the daily trains, each Friday a limited express train leaves Irkutsk for Moscow. We were fortunate in reaching the city in time to take this express. This train is equal to an American palace train, with parlor, library, sleeping- and dining-coaches, lighted by electricity and heated with steam. This express saves several days over the regular train.

As we pass out of this mid-continent metropolis, an American engineer is seen boarding the train. We press his hand warmly, and secure him a seat on the left hand near a window. How good it seems to see a fellow-citizen of the homeland! Although we had never met before, homeland ties make us friends at once. He tells us he is a civil engineer working on the Tiumen Irkutsk canal. "While Siberia has a large number of navigable rivers, with the exception of the one connected with the transportation traffic of this road all run north, emptying into the Arctic ocean, precluding the possibility of successful navigation their entire length. The Siberian Railway crosses the Obi and Yenisei at the navigation head. This has stimulated a canal scheme for river navigation in western Siberia.

"Instead of lessening the importance of river commerce, the completed railways have greatly increased their efficiency. Before the completion of the Ural Railway, freight on the Toora and Tobolsk rivers did not exceed 45,000 tons. After the completion of this railway the freight traffic increased eight times that amount. Now, a regular line of river communication along the Obi-Irtysh system is kept up through a length of 10,000 miles of river navigation, reaching to the most eastern rivers of Russia.

"We are now connecting this great river system with the Yenisei and Lake Baikal river systems at Irkutsk. Do you see that river to the right? That is the Angora river. This is a navigable tributary of the Yenisei. We have found a western tributary of the Yenisei below the entrance of the Angora that runs within five miles of a lake contiguous to the Kiete, a navigable tributary of the Obi. We have cut a canal across to connect through the lake to the Kiete. We can then follow the Kiete river 310 miles to the Obi, and our canal-and-river route is complete. Through the many navigable rivers running north and south we have a perfect river communication with all northern and western Siberia, from Kiakhta on the Senegal. One can then go by water from the Mongolian frontier to the Ural range, connecting Tiomen and Kiakhta (3600 miles apart) by water. Most of the route is now open, and we hope to open the whole canal in the near future."

Thus our American friend explained to us Russia's plan of the Siberian canal-and-river system of transportation.

Just before we reach the rich mining center of Krasnoyarsk, we cross the main stream of the Yenisei on a fine modern bridge 3500 feet long. The Yenisei is the largest river in Siberia, and its valley is sure to be the scene of great agricultural development. The city of Krasnoyarsk is a good illustration of the numerous cities that have been located along this line of road at its junction with good water routes of trade with the interior. At this city we saw sticks of milk for sale. Our American engineer told us that this is the common method of selling milk for seven months of the year. The purchaser puts a stick in his milk brick and carries it home over his shoulder.

At the next station our friend transferred to the branch line that runs to Tomsk. This city is the greatest manufacturing center in Siberia, and is one of the oldest cities, having been founded in 1610. The engineer told us that this city is also the trade center of one of the oldest and richest of Siberia's great mining regions. Mining was started here as early as 1726. Many convict mines, worked by the exiles sent by the government to Siberia, are located here. Gold, silver, lead and iron are stored in unknown quantities in the mountains. More than 500 kinds of colored stones are obtained, with rich quarries of granite, porphyry and other good building-stone. Two springs of hot mineral water have been discovered in this neighborhood, and within seventy-five miles of Tomsk an immense field of bituminous coal has lately been discovered. Besides mining and manufacture, 15,000 men are employed in agriculture, and the fishing industry is profitably carried on.

To Americans it seems strange that the largest and greatest industrial city of Siberia should be reached only by a "stub switch."

When we cross the Obi we enter a great lake region fully 300 miles wide, and reaching through the Kirghiz steppe region to Lake Bal-Kash on the south.

To the north of us, reaching through the northeast region, lies the great forest area,—the home of the panther, lynx, wolf, fox, ermine, glutton, badger, bear, and other wild animals hunted by the nomadic tribes inhabiting this region. This forest zone is estimated to contain two million square miles. All this vast timber is practically untouched. Wood for fuel and timber for build-

ing are here in well-nigh inexhaustible quantities. The navigable streams crossed by the railroad will furnish avenues to bring lumber to market.

In the library car we find an English translation of "Industries of Russia," published by the government; and the work gives us some remarkably interesting statistics. Speaking of the forest region, we find the following: "There are many localities where for tens and hundreds of versts in every direction stand clean plantations of pine, which, with their interlaced summits, hide the sky. The absolutely naked trunks, rising perfectly straight to an enormous height, are so monotonous that a man who once chances into such a part of the Siberian taiga, or even a wild beast, cannot find his way out again. Experienced native trappers are afraid to penetrate into one of these, in their opinion, enchanted spots, and they record every step they take by scoring the trees."

We here learn that north of this forest zone is the polar or northern zone, lying north of the Arctic Circle. This is a treeless plain, sloping toward the Arctic ocean, a frozen, swampy region called the "tundra." Here deep snow covers the ground nine to ten months in the year, and the ground is perpetually frozen in some places from 80 to 100 feet deep. The coldest inhabited place is Verk-hoyansk, in the far northeastern part. All its inhabitants are the Russian officials, and the Yakuts, fur-trading Jews. This town registers an average winter temperature of 53 degrees below zero, with days on record when the thermometer reached 85 degrees below zero.

Here rivers are frozen to the very bottom, and trees have been known to snap and split with the mere force of the frost. In the alluvial deposits of the river valleys, fossil remains of extinct species of elephants and other animals furnish the large quantities of ivory exported from this region. This part is of little commercial value outside of its ivory deposits.

To the south and west extends the agricultural zone, reaching from the Ural mountains at about 60° north latitude, through the northern part of Lake Baikal, and eastward along the line of 50° north latitude. It comprises about one-fourth of Siberia proper.

But how large is Siberia in its entirety? you ask.

An American, Mr. George Kennan, after traveling over the inhabited portion of this vast region, gave his conception of the relative size in the following graphic picture: "If it were possible to move entire countries from one part of the globe to another, you could take the whole of the United States and set it down in the middle of Siberia without touching anywhere the boundaries of the latter territory. You could then take Alaska and all the States of Europe, with the single exception of Russia, and fit them into the remaining margin like the pieces of a dissected map; and after having thus accommodated all of the United States, including Alaska and all of Europe except Russia, you would still have 300,000 square miles of Siberian territory to spare; or, in other words, you would still have unoccupied in Siberia an area half as large again as the Empire of Germany."

Our train is now passing through the wheat-belt that stretches westward through European Russia to the Black sea. This is the region that is now calling on America for millions of dollars' worth of agricultural implements. Counting Russia's demand for cotton-gins and presses for her Central Asia provinces and machinery for her mining interests, with the agricultural implements purchased, the empire imports fully forty million dollars' worth of American machinery annually.

To encourage raising of cereals, Russia has not only experimental farms, but has built large barges to show her farmers a model farm. These barges are built late in the fall. On the deck is laid out a comfortable area for the farm garden; an extensive house is built for the professor in

Wheat for export, at South Russia's Great Seaport, Odessa.

charge, and a smaller house for the crew. Beside the grain and garden beds are located models of beehives. With the spring freshet the barge is seeded and started down the rivers from the dense forest regions of the North. These barges for the present are confined to European Russia, as here the rivers flow south. The crops are tilled and harvested while the barge stops at the river hamlets and villages on the way down. The church-bell rings when the barge reaches a village, and the people come in from the fields to be led by the Starosta (mayor) to the floating farm, where illustrated lectures are given, questions of the farmers answered, and oftentimes seed is left with the more enterprising for planting. By fall the barges reach the treeless steppes, where they are sold for wood, and generally bring enough to pay the down-stream expenses. We are surprised to learn what the government is here doing for the agricultural development of the empire.

The region through which our train passes from Omsk to Samara is the northern portion of the great wheat region whose port of commerce has been Odessa.

From the library we now go to the dining-car for lunch. The traveler can here lunch, dine and breakfast at the moderate price of from three to five rubles per day. The meals are equal to those served at our best American hotels, and the steam heat successfully combats the outside cold. Thus we are well housed and well fed on this government train while we speed westward at a gratifying rate of speed.

At Kurgan we are told we are but 240 versts from Chiliabinsk, the last station on the Trans-Siberian Railway. Trains began to run between Kurgan and Chiliabinsk in December, 1893.

At the last-named place we cross the Ural range and enter European Russia. This range is noted for its rich platinum mines found in the region northeast of Perm and the valuable gold mines found on both sides of the range.

At the city of Samara our road makes a turn to the south, and for several miles we ride along the Mississippi of Russia — the Volga. This river and its tributaries have 50 per cent. of the river traffic of European Russia, which usually amounts to $27\frac{3}{4}$ million tons annually.

The river is navigable for 2000 miles, and is the largest river in Europe. We cross this great water-way of commerce on a high iron bridge opposite Syzran. We now enter a populous region, and stations are close together, though our through express stops only at large commercial centers. The road and the speed of the train from Tula to Moscow make us think of our ride over the New York Central.

Moscow is a large railroad and commercial center; rich in historic legends, and famous as the City of the Kremlin, where all the czars or emperors since the days of Ivan the Terrible have been crowned. The city is said to have been

founded in the twelfth century, and was the seat of government for 400 years. To-day Moscow is the center of Panslavism; the real heart of Russia, though not the political capital. It is reported to be the most characteristically Russian of all the many cities found in the land of the Czar. We are surprised to find many hundred manufactories in textile fabrics, gold and silver plate, jewelry, hardware, glass, porcelain, delft ware, paper, tapestry, chemical products, leather, flour, and sugar.

Moskwa River and the shimmering spires of "Holy Moscow," Russia.

Of the nearly four million spindles and 200,000 looms of Russia, the province of Moscow and its neighboring province of Vladimir claim 90 per cent. Moscow as a commercial center has water communication with the Baltic, Black, and Caspian seas, rail connection with St. Petersburg, Warsaw, Nijni-Novgorod, and, by the railway that brought us to the city, with all Siberia. A heavy sledge commerce is carried on with Tiflis and other points in Asia and southeastern Russia, from November to April. This city is larger than our own St. Louis, and is the second city of the empire.

Entering the Nicolaeosky express, we whirl onward toward the capital city, 400 miles to the northwest. This part of Russia has good railway connections, but statistics show that the empire has but thirty-five lines of railway, approximating a total mileage of 40,000 miles. One of the longest and most important lines reaches from St. Petersburg to Nijni-Novgorod, 1035 versts. This line has a heavy freight traffic most of the year, and during the summer season a good passenger business, especially through July and August.

This is the time of the great Russian fair at Nijni-Novgorod. This fair is held every year, lasting from July 27 to September 6. It is really a large market, visited by more than half a million people from European and Asiatic Russia. The merchants have their own executive committee, before which body everything concerning trade comes. The governor of Nijni with his military staff stays on the grounds during the fair, to see that private rights and public privileges are protected and strict discipline maintained. On the grounds will be found hotels, churches, dining-saloons, theaters, and special quarters for Orientals, as Tartars and Chinese. The grounds have good sewerage, are well supplied with water, and as a protection from fire the whole plot is surrounded with a canal of water. Here, only 227 miles from the heart of Russia, is the empire's greatest fair, a yearly carnival of trade where an average of thirty-five millions of dollars exchange hands. Consul Thomas Smith, of Moscow, says: "Russia exhibits for sale her cottons, prints, carpets, cloths, linen, flannels, silks, lace, bags of jute and hemp, leather, skins, chamois, furs, paper, copper, cast iron, enameled ware, cutlery, agricultural implements, implements for mechanical and other industries, seeds for farmers, oats, corn, wines, spirits, paints, varnish, cement, etc. Sheet iron, boiler-plates, copper, precious stones and a

variety of geological specimens from Siberia are exhibited, as well as cotton in a raw state from central Asia and Persia, and turquoises, silks and silverware, made in Oriental style, from Persia, Bokhara, Taschent, etc."

But look! we are entering the suburbs of that city founded by Peter the Great, in 1703, and now one of the most interesting commercial cities of northern Europe. The city and her citizens wear their winter clothing, the one mantled in white, the other snugly wrapped in furs. Our double-tracked railway curves to the right, and we enter a substantial and commodious union station. Our long overland trip, taking 33 days and covering 9922 versts (6677 miles), is ended. The distance from St. Petersburg to Chiliabiusk is 2810 versts. The railway between the two cities, while under government control, is not counted as a part of the Trans-Siberian system, the latter named city being the western terminus of the Siberian Railway, 7112 versts from Vladivostok. We find St. Petersburg, by winter, so interesting, that we decide to tour the city before we take the steamer for the dear old homeland.

A heavy snow-storm kept us housed in our hotel the day after we arrived at St. Petersburg, but on the morning of November 10th a winter's sun made the snow, frost and ice crystals sparkle like diamonds. Bundled in Russian sleighs, well wrapped up in heavy fur coats with close-fitting hoods, we start to tour the city under the direction of an English-speaking guide.

We hear the morning salute pedestrians give each other, which our guide tells us is, "Your nose! Your nose, sir!" One's nose gets very cold, and would often freeze if some one did not call attention to it, so the owner could rub it with snow to take out the frost. This has almost become the regular winter-morning salute in St. Petersburg.

At the head of a well-trodden street we see a palace sparkling and dazzlingly beautiful in the morning sunlight. It is the crystal palace, that the people of this city make each winter. Square blocks of ice are laid up and water poured on them, freezing the layers into a solid wall of crystal ice. A roof of modern ornamental design with a fine tower or minaret surmounts the whole. The interior is richly fitted up, having spacious rooms in which are ice tables, ice chairs, ice bric-à-brac, and ice flowers. Ice stairs lead to upper rooms, and the whole is brilliantly illuminated at night. The ice furniture is supplied with warm fur rugs, and the palace is the scene of many fashionable parties and grand balls during the winter months.

We are next taken across to a remote side-street, where the town boys have an ice hill. This is a long incline made into an ice slide as the Canadian makes his toboggan snow slide. Nearly all town children in Russia have their ice hills, where girls and boys have keen winter sport with sleds and skates. These St. Petersburg children with the help of their grown brothers build a high tower. On one side blocks of ice are laid to make the incline, and, water being poured on, a solid sheet of ice is formed. One slide is especially made, along which the sleds shall be drawn up. This makes us think of "sliding down hill," and a number of our party get out and join the merry, shouting group. The Russian lads give them all a coast, and when the Americans go whizzing down the ice hill like veterans at the art, they are greeted with an applause that is as satisfying as the sport is exhilarating.

With tingling cheeks, fingers and nose, the coasters enter the sleighs and our guide pilots us to one of the many bridges that connect the two parts of the city. Here we alight and go down the steps cut in the bank to the ice, for a chair-ride across the river. These chairs have warm covers, and men on skates push them over the ice. This is the passenger ferry, and chair-pushers do a profitable business all winter, although it costs less than a penny to cross the river.

We return to our sleighs and are driven over the Petersborough side of the city. This part is situated just off the mainland, to which it is connected by 150 bridges. Here are the warehouses and other buildings that reveal an extensive commerce.

Nearly two-thirds of Russia's foreign commerce passes through this city. From our consul we later learn that the ten leading imports in order of rank are: Raw cotton, engines and machinery, tea, steel, sheet and bar iron, coal and coke, chemicals and drugs, salt or dried fish, raw wool and raw silk; obtained principally from Germany, Great Britain, United States, China, Finland, France, Austria, Belgium, Persia, Egypt, and Italy — the amount of purchase being in the order named.

The leading exports in order of rank are: Corn, flour and meal, wheat, flax, lumber, rye, barley, oats, linseed, petroleum, sugar, eggs, and cotton manufactures. Russia holds third place in cotton-spinning in the world. The leading countries to which Russia sends her goods rank as follows: Germany, Great Britain, Holland, France, Italy, Austria, Belgium, Turkey, Persia, Denmark, and Roumania. Russia is increasing the quantity of her manufactured exports, while her manufactured imports are being correspondingly lessened.

The quays along the Neva river-front are extensive, and mostly of hewn stone. The making of artificial water-ways and dredging of the river has made this city a port of entry for even large ocean steamers. Ice-breaking steamers keep the port open to commerce during the winter, where formerly 150 to 200 miles of ice shut St. Petersburg's water-gates five months of the year.

At the wharf we see a vessel loading; her flag indicates an American port for the steamer's destination. Through our guide we found that the boat was a "tramp" steamer that had brought over a cargo of raw cotton and machinery and was taking a cargo for Hamburg, Antwerp, and Havre. From Havre the steamer would reload and clear for New York. The "tramp" was preparing to clear port on the 12th, and we therefore bargained for staterooms and made arrangements for tickets of passage.

At the exchange we learn that the port registers upwards of 3000 entries per year.

Pointing to a large factory, our guide tells us the very finest leather for bookbinding is there manufactured — the Russia leather. Across the block is a large bookbindery. This city is the very center of the empire's book trade. We are shown manufactures of cotton, silk, woolen goods, cannon, glass, tapestry, and scores of other commodities sold throughout the empire.

On Citadel Island we find the old citadel and one of the nation's large mints. Here we learn the value of the Russian coins. The legal unit is the silver ruble of 100 kopecks. Officials calculate one ruble equal to 51½ cents United States money. There are three gold coins: the imperial, 15 rubles; half-imperial, 7 rubles; and the 5-ruble piece. Besides the silver ruble and the gold coins named, paper or credit notes of 100, 25, 10, 5, 3, and 1 ruble are printed by the Government, and are legal tender for all debts, public and private.

Farther down the river, on Vasile Island, we are shown the Academy of Arts, the Academy of Sciences, with a fine museum, an observatory, and a library containing upward of 125,000 volumes. This latter school was founded by Peter the Great. Here also is the mining school, with a celebrated selection of minerals and a rare museum of Oriental objects. On this island also are the fine barracks, the West Point academy of Russia, filled with cadets.

We observe that the banks of the canals are protected by walls of hewn granite. This part of the city is but little above the level of the river, and more than once the Neva has overflowed, causing loss of life and great destruction to property. A gale from the west, with high tides in the adjacent gulf in the spring when the annual breaking-up of the ice occurs, would well-nigh submerge the whole

Bridge in St. Petersburg.

capital, but in the 200 years that the city has existed these three have never occurred at the same time, and probably never will.

The Neva river is Lake Ladoga's outlet to the sea. This lake is about the size of Lake Ontario, but, while Ontario is 250 feet above sea-level, Ladoga is less than sixty feet. This lake gives the city canal and river communication with an almost unlimited range of inland territory.

We are driven across a picturesque bridge into a large open square, in the center of which stands Saint Isaac's Cathedral. This edifice is symmetrically perfect, gigantic in its proportion, and magnificent in its simplicity of architecture. The original church was constructed by the city's founder, but the present building was erected during the second quarter of the nineteenth century.

The foundation is a forest of 21-foot piles sunk in the swampy soil. This alone cost two million rubles. The whole building cost thirty million rubles. Opposite to this cathedral is the greatest monument in the city — the statue of Peter the Great. The great Czar is represented reining in his steed on the very brink of a rock, whose sides as well as front are precipitous. His face is toward the river Neva, his hand pointing outward and upward. The spirited steed has trodden upon a serpent, typifying the difficulties Peter encountered in founding the city. This equestrian statue is well balanced on the hanging rock, weighs sixteen tons, and the head is said to bear a striking resemblance to the great Peter.

Scarcely one of the many open squares in the city that does not have one or more bronze statues of a national hero or noted czar. As we turn another corner we see a solid red granite shaft, 154 feet high, bearing the inscription, in Russian, "To Alexander I.— Grateful Russia."

Opposite this column we face one of the largest palaces in the world. It seems built in the form of a square, and as our guide said, has spacious and beautiful halls enriched with rare and costly statuary, gems, paintings and malachite furnishings. The cordon of soldiers shows that the Czar is in the palace with his family of 6000 courtiers and attendants. The Salle Blanche or White Hall, decorated in white and gold, is where the court festivals are given. The winter entertainments in this palace have scarcely an equal in all Europe. On one side of the palace are the State buildings, the home of the several ministers.

Connected to the Winter Palace by a covered gallery is the elaborate palace built by Catharine II. for a picture gallery and a resort of pleasure. For this reason it has been named the Hermitage. It is now a famous museum, containing 300 original paintings by the world's great masters, besides

many other works of art; a collection of once famous private libraries, a royal theater, and a grand floral conservatory planted with the choicest flowers and shrubs, heated by subterranean fires, and sheltered by a glass covering.

Our guide now bids us look up Nevski Prospekt. This is the "Euclid Avenue" of Europe, 150 feet wide and fully four miles long, lined with stately trees which are now covered with snow and ice, glittering in the afternoon sun.* The beauty of the rich and costly palaces and cathedrals, the Grand Bazaar with its 10,000 merchants and massive public buildings for which this street is famous, is all forgotten before this indescribable picture the sun has "thrown on the canvas." St. Petersburg, with her 200 beautiful churches, the spire of some, like the Cathedral of Peter and Paul, nearly 400 feet high, with her colossal public buildings and rare mansions, can present no other picture so superbly beautiful as Nevski Prospekt under a winter's sun; so we choose it as our last memory of the Czar's capital, and go to our hotel to rest and prepare for the journey home.

Nevski Prospekt, the Principal Street in St. Petersburg.

At the hotel we learn that from the Admiralty Building is the finest view one can have of the city; that from this large public building radiate St. Petersburg's three finest streets.

An English traveler very interestingly described to us his visit to the Imperial Library, stating that nowhere in the world can one find so complete a collection of the books of the Middle Ages as this library contains. Here are the masterpieces of literature, of all ages and all nations, systematically arranged and numbering more than one million volumes. He tells of the schools and colleges of the city, and narrates an amusing experience he had one Sabbath-day when he first came to the city, direct from London with Greenwich time. (Russia is the one nation of Europe that still uses "Old Style," many days different from "New Style," the adopted system of the rest of Europe.) He told us that on a certain street in the city the gospel is preached in twelve different languages each Sabbath. His sledge-ride over Lake Ladoga and skating-party on the Neva were most graphically described, and helped us to pass a very pleasant evening.

* The trees have grown up since the picture on this page was taken.

A Winter Voyage Across the Atlantic.

"All aboard!" The steamer whistle sounds, the gang-planks are in, and a bustling tug pulls the "tramp" into the ice-cleared channel. While the steamer is not designed especially for the passenger service, we find our accommodations ample and the "tramp" a vessel of very respectable size, whose officers are most courteous and obliging.

A few miles below the city we observe the wide expanse of the river, and learn that the Neva

The Fountains from Peterhof Palace, the Summer Residence of the Czar of Russia.

spreads out to a broad estuary eight to ten miles wide before it reaches the gulf. All sorts of ice craft are visible, and the river seems alive with busy people going and coming from the capital.

To the southwest across the river we see the yellow palace of Peterhof. Its site is a natural elevation of about sixty feet, and the building represents the eighteenth century architecture, as it was built by Peter the Great. Succeeding rulers have so improved the grounds with parks, terraced gardens, groves, embowered paths, fountains, waterfalls and statuary that they rival the surroundings of Versailles, the finest palace-grounds in Europe. In front of the palace is the "Samson" fountain, which sends an 80-foot jet of water in the air to descend in shining spray. Scores of lesser fountains with playing jets reveal a design of waterworks as beautiful as it is intricate. Now all is quiet and deserted, and the visitor would find the plan of the grounds concealed beneath a thick mantle of snow, and he could not enter the palace unless he could show a special permit from the proper official.

Thirteen miles down the river we come to a series of low flat islands, the group being about one mile wide and five miles long. Here is located Kronstadt, for more than a hundred years the port of entry for St. Petersburg. The harbor is divided into three sections, one of which is large enough to accommodate 1000 merchant vessels. This is the "Gibraltar of Russia," the seat of her Baltic fleet, and conceded to be the strongest fortified city in the world, now the chief naval station of the empire. Commanding the southern channel, which is narrow, is the famous castle built by Russia's great founder, which more than once has kept the great navies of Europe at bay. The foundations of this fortress are on a sandbar, but still are most substantial. The Russians tell us that Peter the Great laid these foundations on ice, in the winter of 1703. He built huge boxes of sound hewn timber, and loaded them with stones. When the ice melted in the spring these boxes sank down into the sand and gave a sound, substantial base, on which this famous fortress was built. With the numerous forts and batteries on the opposite island mounting modern guns of defense, and this islet fortress, the fortifications of Kronstadt are practically impregnable. To direct the pilot through the north channel is a lighthouse at the northwest point of the west island.

Our steamer now heads out into the Gulf of Fin-

land, that great arm of the Baltic, which reaches inland 250 miles and averages between sixty and seventy miles in width. It is crossed by the 60th parallel of north latitude, and until the days of the ice-breaker all its harbors were closed by ice from late November to the middle of April. It receives such a volume of fresh water from the rivers that drain the lakes of Finland and northwest Russia that the water of the gulf is but slightly salt, and cattle readily drink it. Away to the north and west is the port of Helsingfors, the capital city of Finland; and near it, built upon seven islands, each connected by subterranean tunnels with the main fortress, stands the remarkable fortress of Sweaborg, considered one of the very strongest harbor forts ever built. It is on the southern shores of this gulf that commercial quantities of amber have been found.

After steaming westward several hours our vessel rounds out into the Baltic, and with her bow southeast, steaming her way across this trackless, tideless sea, we enter a moonless winter night.

The next day we pass to the south of the mid-Baltic island of Bornholm, large enough for four cities of commercial size. On the 16th we reach Holtman, on the Bay of Kiel, 950 miles from St. Petersburg. This port is the eastern entrance to the Northeast Sea Ship Canal, locally called the Kaiser Wilhelm Canal. Were it not for this canal we should have to spend three days steaming around the Jutland Peninsula to Brunbüttel, at the mouth of the Elbe. This shows the great commercial value of the canal, as in a few hours we pass from the Bay of Kiel to the North sea, and, steaming up the river sixty miles, reach the port of Hamburg at noon on the 17th of the month. At one of the many docks of this free port our vessel parts with her Hamburg cargo and receives a consignment of Christmas toys, chemicals and drugs and decorated ware for New York.

Great Bridge over the Elbe, Hamburg, Germany.

This city was founded by Charlemagne, more than a thousand years ago, and was one of the leading free cities of mediæval times. Hamburg is connected by railway with all parts of the continent, is the center of distribution for central Europe, is a noted manufacturing center, contains one of the three great shipyards of the empire, and is the greatest commercial port of continental Europe, the third port of commerce in the world. Its commerce with America exceeds that of any northern port city of Europe, running several direct steamer lines to our Atlantic seaboard. These steamers at high tide can come up the river. The city is intersected by numerous canals, and in the center of the city is the Alster Basin, a sheet of water one mile in circumference, bounded on three sides by three wide streets lined with stately trees. In the winter-time this makes an excellent skating-rink; while omnibus steamers, pleasure-boats and snow-white swans contend for control of the surface of this city lake in summer.

Early the next morning after our arrival our steamer drops down the Elbe, and, passing between

In the Market, Hamburg, Germany.

Cuxhaben and the Island of Newwerk, we turn east through the North sea for several degrees. At 6 degrees east longitude our vessel bends to the south, keeping well to sea while rounding the islands that inclose the Zuyder Zee. We run along the coast of Holland to the mouth of the West Scheldt. Entering this river at high tide, we steam up forty-five miles to the oldest port in Europe — Antwerp, the Flemish home of Rubens, Vandyke, and the Teniers, renowned in art. All the docks are built of stone, and when one knows their cost to have been forty million dollars, he can form some conception of their magnitude. Belgium in all her forty-two miles of seacoast has not one good harbor, and nearly all her sea trade therefore passes through this port on the Scheldt river. Although Brussels is the capital, Antwerp is the center of the railway and canal systems of the nation. The canals drain the lowlands and constitute the highways of this nation. This makes Antwerp a great distributing point, through which millions of dollars' worth of freight is annually sent to Germany and Switzerland as well as the inland cities of Belgium.

Within a few hours our steamer has unloaded the freight brought from St. Petersburg, and received many thousand bolts of the celebrated Brussels lace and several hundred barrels of glassware for New York. We learn that large sugar refineries are located here, and the very finest carpet and lace factories. The flax fiber for the lace is carefully selected, and the spinning is done in dark rooms, always with a certain per cent. of moisture and kept at a uniform temperature. This special care in quality of fiber and character of work makes the lace cost from twenty-five to fifty dollars per yard.

The Cathedral of Antwerp is one of Europe's most celebrated memorials of Gothic architecture. Its musical chimes consist of eighty-six bells. Here are collected masterpieces of many famous painters: a Mecca to the art-loving world. All this country is cultivated like a garden, and the soil, being largely alluvial deposit, yields abundantly. The steamer coals at this port, for Belgium produces, next to England, more coal than any other European nation. The low mountains in the southeast also yield zinc, lead, iron, and manganese in commercial quantities. Although this nation is not as large as Maryland, it has six times that State's population, and a commerce averaging two-fifths of our whole nation's commerce. We also learn that Brussels and Mechlin lace, the linen and damask cloth of Liege, the woolen goods of Ypres, the carpets and hosiery of the whole nation, compete with the looms and factories of the entire manufacturing world.

The sun is on the horizon when we pass the Flushing lighthouse and stand out again to sea. The North sea here narrows into the English chan-

nel, for it is but ninety miles across to Harwich from the Flushing Light. Near the port of Calais we enter the narrower part of the channel — 21 miles wide — known as the Strait of Dover. After the passengers had all gone to bed the "tramp" entered the English "sleeve" or channel (the Franch call it La Manche, as it is shaped like a sleeve), and encountered a stormy sea. Bearing to the left, the vessel lowered speed and headed south by southwest for a hundred miles, before it came to waves of more moderate force with winds more subdued.

"Pont Alexander III."— Most splendidly decorated bridge in the world— Exposition, 1900, Paris, France.

The next morning we found the "tramp" at one of the finest docks in the world, on the right bank of the Seine, in the port that is the center of French commerce with the United States — Havre. Stevedores, we saw, were busy taking out the much-coveted furs and loading drays with barrel after barrel of petroleum. We go up in the lighthouse and "view the landscape o'er." North of us rolls the English Channel, over 100 miles wide at this point. To our left is the River Seine, that here enters the channel. The river is here seven miles wide, affording excellent harbor facilities. This river is navigable for 300 miles; ocean steamers of 2000 tons can ascend fifty-six miles to Rouen. Inland we look over the city, that Louis XIV. caused to be founded at the beginning of the sixteenth century; that Francis I. fortified and caused to be made a port; that Louis XVI. ordained; and that the enthusiastic French declare to be the finest watering-place in all their nation with its many hundreds of miles of coast.

Yonder you see the shipyards that produce the nation's best liners and men-of-war. Near by is one of the large dry-docks, 515 feet long and 100 feet wide. Beyond the dock where the "tramp" is unloading is the L' Eure dock, capable of accommodating many hundred vessels. Farther removed from the shore we see the School of Navigation, with its observatory, the Commercial court, and upon the heights commanding both sea and river the new forts. Between the forts and the lighthouse is the business portion of the city, the site of many large manufactories and valuable shops. The 120,000 people of this city have made Havre, next to Marseilles, the greatest ocean port of France, handling nearly 17 per cent. of the whole nation's commerce.

We return to the dock where our vessel is loading her French cargo for New York and immigrants are going up the gang-plank, taking steerage passage across the sea. We find Swiss toys and watches, and Parisian dolls and silks, constitute a large part of our vessel's new cargo. These are Christmas goods for the American market. By far the largest part of the cargo is seen to be French dolls. One firm in Paris is reported to manufacture 2000 dolls a day, while the manufacture and sale of this one commodity in Europe is estimated to exceed twenty-six million annually. The miscellaneous articles that are in-

The favorite drive, Avenue Champs Elysees, from the Arch of Triumphs to the Place de la Concorde, Paris, France.

cluded in our cargo consist of wines, perfumery, and toilet articles.

We long for a run up to Paris, 143 miles, before we sail for home, but, finding that the "tramp" expects to "clear" at 4 P. M., know that we cannot have time for the trip. The cargo in, the "tramp" takes on 1000 tons of coal, provisions for her passengers, and the et cetera needed for an ocean voyage.

While eating dinner at a French café we see a very interesting illustrated article on provisioning a transatlantic liner. The facts and data given enable one to form some conception of the amount of food necessary to provision a large passenger steamer for its trip across the ocean. The "tramp" could take only a few hundred passengers; the one described in this article carried 1617 passengers when her quota was full. The following articles we read as going into the ship's larder:

1. MEATS.
   - (*a*) 14 steers, reduced to 18,000 lbs. of beef.
   - (*b*) 10 calves, reduced to veal (1200 lbs.).
   - (*c*) 29 sheep, reduced to mutton (2200 lbs.).
   - (*d*) 26 lambs, reduced to meat (1200 lbs.).
   - (*e*) 9 hogs, reduced to pork (900 lbs. pork, 600 lbs. ham).
   - (*f*) 1500 chickens, geese, and ducks (6000 lbs. poultry).
   - (*g*) 1700 lbs. fish.
   - (*h*) 400 lbs. tongues, sweetbread, etc.

Total meat foods for Atlantic voyage, 86,200 pounds (43 tons).

2. VEGETABLES.
   - (*a*) Potatoes, 175 bbls.
   - (*b*) Assorted vegetables, 75 bbls.
   - (*c*) Tomatoes and table celery, 20 crates.
   - (*d*) Lettuce, 200 dozen.

3. FRUITS.— Assorted fresh fruits, 9000 pounds (4½ tons).

4. BREAD, PASTRY, etc.
   - (*a*) Flour, 8½ tons (90 bbls.).
   - (*b*) Yeast, 350 lbs.
   - (*c*) Oatmeal and hominy, 600 lbs.

5. ICE, 40 tons.

6. EGGS, 1700 dozen.

7. ICE CREAM, 1000 bricks.

8. OYSTERS AND CLAMS, 14 barrels.

9. LIQUIDS.
   - (*a*) Milk, 2200 quarts.
   - (*b*) Cream, 300 quarts.
   - (*c*) Drinking-water, 400 tons.
   - (*d*) Wines and liquors, 12,000 quarts.
   - (*e*) Beer (in kegs), 15,000 quarts.
   - (*f*) Beer (in bottles), 3000 bottles.

This led us to realize what a factor in food commerce a great seaport like Havre must be. What a market its shipping, aggregating 3¾ million tons a year, must make. The provisioning its hundreds of ocean liners for their world voyages gives employment to thousands and thousands of merchants, middle-class men, and farmers.

At 4 P. M. on that November day (November 21st) we "cast off" and clear for the homeland. The ride down the English Channel is a "choppy" one, and a storm seems brewing, for scudding clouds cover the western and northern horizon, and night seems to just drop right down. We had hoped to catch a glimpse of Cherbourg harbor, famous for the naval duel between the Alabama and

the Kearsarge, but we were only able to see the harbor lights far away to the south as we passed on down the Channel.

Just after midnight our vessel encountered a heavy fog, and slowed down to eight knots an hour. At regular intervals the fog-whistle is blown, and its hoarse note banishes sleep; so we decide to get up and try the deck. The officer of the deck reluctantly permits us to do this, as he considers the deck of a rolling vessel in the intense darkness a dangerous place for passengers not accustomed to it. He shows us a sheltered place near the bow on the opposite side from the wind, and, enveloped in heavy winter wraps, we try to "hang on" and sit in one place. All around is inky blackness, while the atmosphere has a cold, clammy feeling that sailors say generally precedes a storm at this season of the year.

The boundless Ocean from the wild and dreary Cliffs of Land's End, England.

Suddenly we see far ahead and to the right a twinkling star, low down in the black canopy where sky and water should meet. After a time it seems higher and brighter, and when we have about concluded it is a morning star, the officer of the deck informs us that it is the "Eddy Light of the Scilly Islands." It is our last landmark this side of the ocean, and is in the most dangerous part of the Channel. We keep well to the north of it.

Some time afterward we heard another fog-whistle, well to the west, and soon lights showed a steamer approaching. When several miles from us her searchlight was turned in the direction of our fog-whistle and our vessel fell within its ray. What an intense light! — such a contrast to the Egyptian darkness that had but an instant before enveloped us. The "tramp's" steamer-lights were flickering candles of minimum power compared to that electric searchlight now turned upon us. When we came nearer to the vessel we saw that from stem to stern were lights, and it loomed up before us like a swiftly moving mountain. One of the deck's crew told us the vessel was an "ocean greyhound," a through liner from New York to Hamburg — the Deutschland. As it passed we felt its speed and force in the waves that rolled under the "tramp," while its many-colored side- and stern-lights left a vivid picture in our mind.

The Deutschland passed on out of sight in the night, but it left a train of thought that led us to review the wonderful improvements made by the marine engineer since Symington fitted a Watt's engine to drive the steam paddle-wheel of the Charlotte Dundas at the rate of six miles an hour. We see the glowing accounts printed of the Savannah's wonderful record — the first steamer to cross the Atlantic. This was in 1819, and the steamer crossed the Atlantic in twenty-five days, using pitch-pine for fuel, as it was before the days of coal. She had reduced the time from four to six weeks by sailing-vessel to less than twenty-five days by steamer. Now at the opening of a new century we see the specially built Viper rush through the water at forty-two miles an hour, and a regular ocean liner, the Deutschland, which has just passed, a vessel of 23,200 tons burden, plowing through

the water at eighteen knots an hour — and then not going at full speed. This vessel has reduced the time from the Cherbourg Mole to Sandy Hook Lighthouse to five and one-half days. Her log for this shows her daily runs on a certain trip to have been 337, 566, 570, 570, 584, and 423 knots. Her average speed was 23.02 knots per hour.

This greyhound gets her steam, not with pitch-pine like the pioneer, Savannah, but with coal, consuming upward of 500 tons per day. As she must always be prepared for emergencies, the Deutschland's coal-bunkers will hold 5000 tons, and her officers see that they are all pretty well filled before they undertake a voyage.

So large are the modern Atlantic passenger liners, so elegantly are they furnished and so expensive is their service, that most of them must earn $80,000 each trip before they can begin to net a dollar to their owners.

Thus our thoughts run on until Morpheus kindly relieves us, giving mind and body Nature's best tonic and restorative — blessed sleep.

Late the next morning we went down to breakfast. The steward had placed a frame on the dining-table to secure the dishes in case of a storm, and foot-rests under the table enabled one to maintain his seat in ordinary weather. There were but few at breakfast this morning, and just as we were finishing breakfast the wind struck the ship. Most of us were shot clear under the table, and anointed with the soups, coffee, etc., of the table, while en route. Even the veterans of the sea found it an acrobatic feat to keep their chairs. It was the struggle of our life to get to the stateroom, which was finally reached by going "on all fours."

A northeaster had struck the "tramp." The careful sailors had removed all things from deck that could be washed overboard, hatches were closed, and the crew at their post prepared to help the ship weather the gale. The previously dark clouds suddenly seemed to break up into great flakes of snow that filled the sky and were blown everywhere by the wind that now roared like a powder-blast. The waves seemed mountain high, and our vessel would rise to the crest of a wave, where it seemed to pause for a moment, trembling in every fiber, and then plunge down into the trough below.

Occasionally, as though tired of this ceaseless climbing up only to go down again, our boat would "ship" a wave — deluging the deck and causing us to feel that we were in a diving-bell headed for the bottom of the sea. Slowly we came out of the trough, and when we again reached the crest of a wave the wind joined the rushing waters of the sea and tossed the "tramp" about like a cockle-shell. We seemed to be in the power of a hundred Niagaras, and the shifting wind was blowing great gusts all the while.

How utterly insignificant man's work becomes when tested by the boundless, omnipotent sea! We appeared absolutely at the mercy of wind and wave. The boldest in our number were filled with terror, and would have given their "bottom dollars" to stand on the solid earth once more.

We seemed to see the flying Dutchman, his sails in shreds and the whole ship icicled by the winter storm, blowing through his trumpet, imploring us to take letters home for him. Like him, we seemed to be beating in vain and Judgment Day near at hand.

But our captain called this only "half a gale," and steamed on his way, guided by the compass. For twenty-four hours this storm raged, and then the wind lulled. It proved to be "the calm before the storm," and the waves, being long, gentle swells, warned the experienced seaman to be on the alert.

Just before midnight we entered the storm area, with the wind blowing at eighty miles an hour.

> "We were crowded in the cabin,
> Not a soul would dare to sleep,—
> It was midnight on the waters
> And a storm was on the deep,"

came into mind, and impressed its full meaning.

We think of the shipwrecks we have read of,

and that disastrous hurricane of September 9th, 1900, seems really upon us. This hurricane destroyed the city of Galveston, Texas, and damaged shipping from there to Nova Scotia on the Atlantic seaboard, its effects being felt hundreds of miles at sea. In answer to our questions, a ship's officer said we had encountered a hurricane at sea, the grandest example of the cyclone.

The largest class of hurricanes originate between the West-African coast and the Windward Islands. Storms originating here move west across the ocean to the American coast, and, being deflected, recurve upon Iceland, Scotland and Norway, or, following the African coast-line, they lash to foam the Bay of Biscay and are lost off the coasts of Portugal or Britain.

Great heaps of wreckage piled high by the mighty waves.—Galveston disaster.

Navigators at sea, from the reading of the barometer, character and direction of the wind, and their own personal experience, learn how to avoid the storm-center, and if in mid-ocean may take advantage of the wind to hasten the vessel's course. The waves during the calm, and the barometer as well as the veering wind of the hurricane, prepared our captain to so direct our course that we passed to the right of the storm-center. With our fog-horn blowing every half-minute, the howling wind lashing huge waves against, around and over the ship until it quivered and creaked and groaned, sleep was banished. Then the tramp sprung a leak, and the thug! thug! of the steam-pumps was heard while officers went below to repair the leaks.

In the midst of the roar and tumult of the tempest there came the questioning appeal of the skipper's daughter:

"Is n't God upon the ocean
Just the same as on the land?"

Yes, and with faith's return came the first stanza of Cowper's hymn:

"God moves in a mysterious way,
His wonders to perform;
He plants his footsteps in the sea,
And rides upon the storm."

When the morning sun shone out the storm had passed, and once more we were permitted on deck. All around were whitened waves many feet high and as many feet deep, seemingly running like race-horses. The picture was surely awe-inspiring, and the heavy splash of an occasional wave on deck gave us some idea of the force and action of the hurricane-waves of the night before.

These storms are most frequent from July to October. In the earlier stages they are from 25 to 200 miles wide, but in the course of several days may reach a diameter of 1000 or 1200 miles. Poey has published a table recording 365 hurricanes on the Atlantic since Columbus sailed across it.

To our question of the ship's location, we receive the reply: "41° 30′ north latitude, 19° 46′ west longitude." "We are several days from our

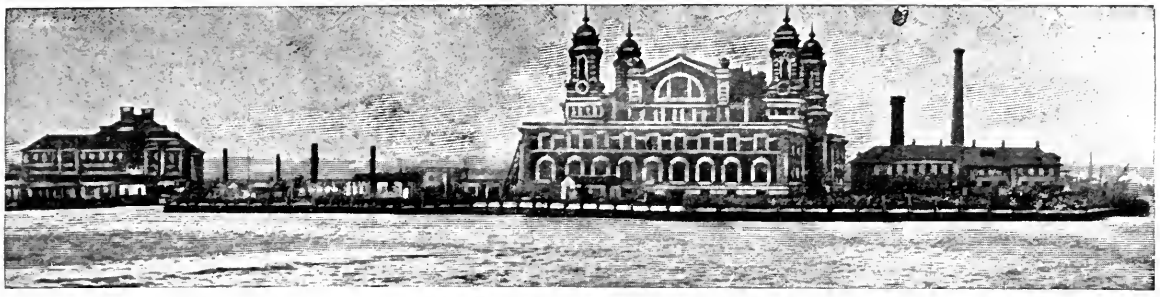
course," the mate said, "but we were lucky to get off as well as we did. Our cargo is still safe, the leaks are stopped, and the machinery is not damaged. We can regain our course, with anything like favorable weather, in a very few days. We will not encounter another storm this trip, and need fear nothing until we reach the Newfoundland fogs."

The "tramp" bore N.N.W. until it reached the Northern route, followed by most transatlantic steamers from August to January, and, turning into the course of west-bound vessels, bore steadily on her way.

Near 40 degrees west longitude our course bore more to the south of west, and after a day's sailing we came to the region of the Arctic current. For some time we have been in the deep blue of the Gulf Stream. Off the coast of Newfoundland this ocean current, which at this time of the year is from 15 to 30 degrees warmer than the surrounding waters, meets the Arctic current, which is nearly as many degrees colder than surrounding waters. This meeting of a cold and warm ocean-current condenses the vapor in the warm air of the Gulf Stream, causing the fogs that are so constant and such a menace to navigation in this region. After a few scores of miles the Arctic current turns in toward shore, and thus for several hundred miles there is a clear line in the color and temperature of the water which marks the south-seeking cold current and the north-seeking warm current. The Arctic current finally disappears beneath the warmer current, while the Gulf Stream is traced across the Atlantic, tempering the shores of western and northern Europe.

This current, with such a remarkable influence on climate, crops, and commerce, has its origin in the vicinity of the Gulf of Mexico. As it passes Florida strait it approximates 30 miles in width and from 1500 to 2000 feet in depth, with a temperature approximating 25 degrees centigrade. Off Hatteras the Gulf Stream is twice as wide and a third as deep, and its temperature from 8 to 10 degrees C. warmer than surrounding waters. At about forty degrees north latitude it divides. The larger tropical branch goes south and east, enters the tropical waters, is deflected by the African coast, and returning, enters the north equatorial current near latitude 10 degrees and longitude 40 degrees. The other branch continues as indicated above. The Gulf Stream is to the Atlantic and Europe what the Kuro Sivo or Black Water is to the North Pacific and North America.

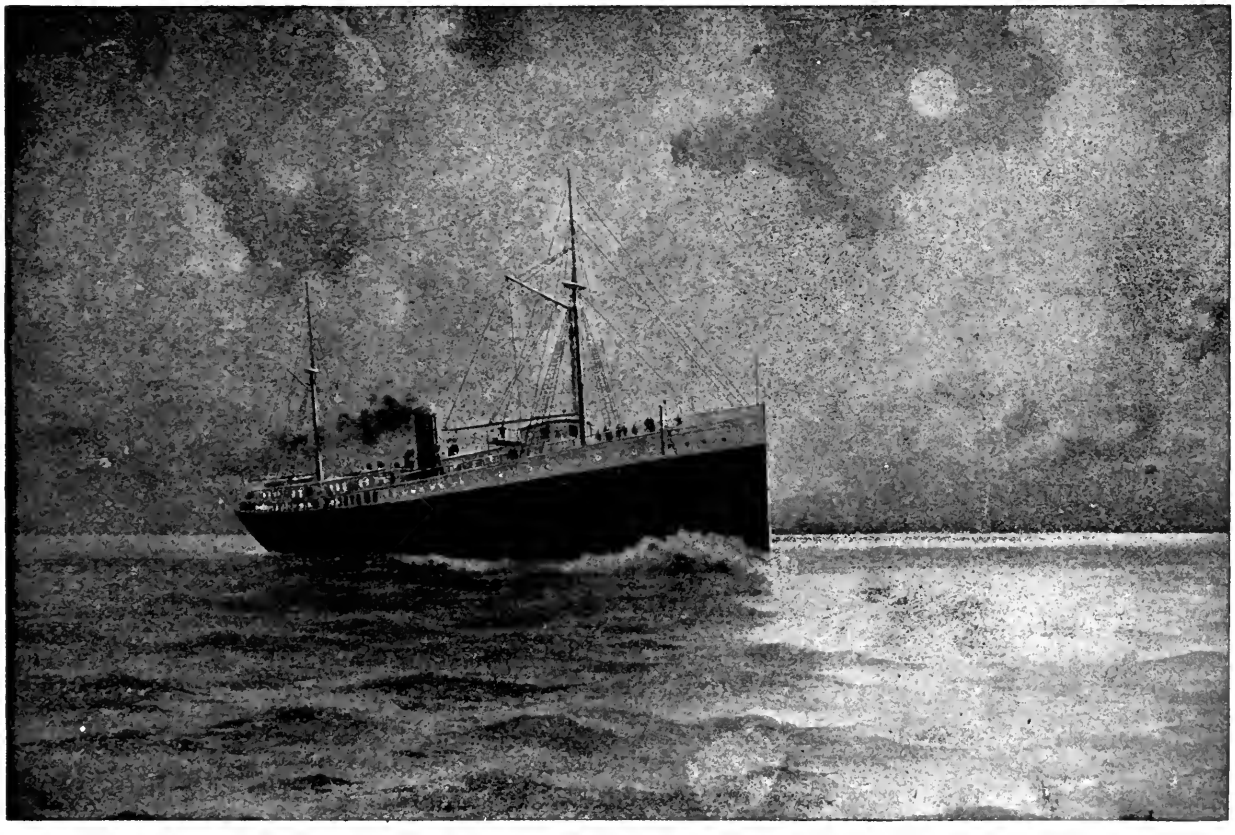
Thanksgiving Day we had a real New England dinner, with a concert in the evening. On the morning of December 7th we sighted Sandy Hook light-ship, and at noon we reached Ellis Island, the finest immigrant station on the globe. The United States Bureau of Immigration has already expended one and one-half million dollars in buildings, and has improvements projected that will cost as much more. The care of immigrants is intrusted to some 200 faithful attendants, who can provide for 7000 arrivals per day. These employés of the Government are physicians, interpreters, clerks, matrons, and inspectors. These employ such assistance as shall be needed to house and feed the immigrant for the short time that he is detained at the island. Should any immigrant be unable to pay for this service, he is fed and housed gratuitously, the Government looking to the steamship company which brought over the poverty-stricken stranger for its pay. All immigrants who cannot show thirty dollars in cash, if likely to become a public charge, are sent back to the country from which they came. From six to ten missionaries are stationed here to look after the spiritual wants of the immigrants. The Government has set apart a large, well-furnished room for their use, and provides it with desks, cabinets, stationery, and such printed matter as the missionaries require. Here the Havre immigrants disembark.



United States Emigrant Station, Ellis Island, New York Bay.

Steaming up North river, our vessel reaches her pier, the gang-planks are let down, and we stand on the dear old homeland that we have not seen for so many months. We left Boston, our great New England center of commerce, June 28, and complete our commercial trip around the world by entering our Nation's greatest port, the second commercial city of the globe, December 7th.

"Breathes there the man with soul so dead
Who never to himself hath said,
This is my own, my native land!
Whose heart hath ne'er within him burned,
As home his footsteps he hath turned
From wandering on a foreign strand?"



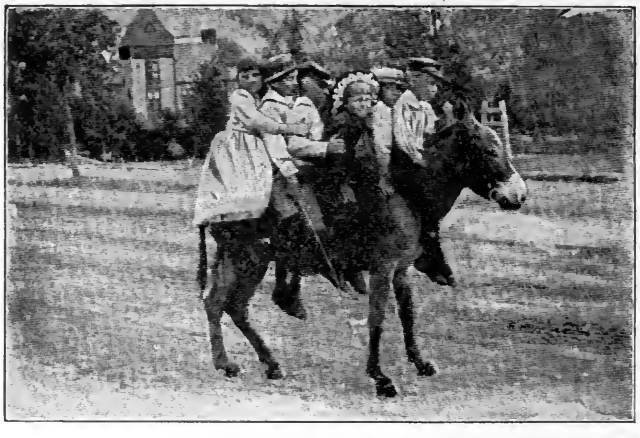
On the Ocean.

New York by Moonlight.

PART III.

FACTS FOR LABORATORY WORK.

CONTENTS.



A Short Excursion.

MINERAL COMMERCE.

Next to food commerce, with its vast quantity of freight transported, surpassing in money value any other traffic, is the mineral commerce of the world. Minerals depend upon neither climatic conditions nor the physiography of the country. All life, whether animal or vegetable, depends upon mineral substances for many essential foods. Leaves must have mineral substance to form ribs and veins, and animals must have mineral matter to form bones and teeth. Minerals are widely distributed, and are found in the mountain, on the plain, and by sea, lake and river shore. Materials as yet unconsolidated, that have been washed down from hill and mountain slopes, composed of rocks containing metals or ores in either veins or irregular dissemination, are called superficial deposits. The precious stones of Ceylon, platinum of Siberia, "stream tin" of Cornwall and Banca, and surface deposits of gold in Colorado, California and Nome City, illustrate this class.

Many useful minerals are found in layers or strata or are veined through sedimentary rocks in certain localities. These are called stratified deposits. Iron ore and coal are most frequently found in beds, while the copper in sandstones of New Mexico and the conglomerates along Lake Superior illustrate the veined deposits. Often these stratified deposits have been changed, by volcanic or earthquake action. This gives what some authorities call a third division — unstratified deposits. These changed beds of ore are now believed to have been originally deposited in horizontal layers. These layers were subjected to later changes, as the iron ores of Missouri, Lake Superior and the Alleghany mountains seem to indicate.

A mineral that possesses certain marked physical or chemical properties is called a metal. The most universal characteristic is luster. The more important and useful metals are as follows:

Name.	*Date of Discovery.*
Gold	Known to ancient world
Silver	" " " "
Mercury	" " " "
Copper	" " " "
Lead	" " " "
Tin	" " " "
Iron	" " " "
Bismuth	Fifteenth century
Antimony	Fifteenth "
Zinc	Sixteenth "
Platinum	1736
Nickel	1751
Potassium	1807
Sodium	1807
Calcium	1808
Aluminum	1827

The first two metals are of such value in the commercial world that they are called precious metals.

When a metal is found unalloyed, or not mixed in sedimentary deposits, it is called native, or free. If it is combined with some other substance it is called an ore.

The more common ores show oxygen, arsenic or sulphur to be the element in combination with the metal, and these must be removed and the metal purified by a process called smelting. One of the largest smelters in the world is at Argentine, Kansas, where gold and silver ore from certain Colorado mines is refined.

The excavation made to extract minerals from the interior surface of the earth is called a mine. The Egyptians are believed to have been the earliest miners. Abraham, the father of the Jews, twenty centuries before Christ, found gold and silver in common use among these people. Records show mines of copper, silver and gold to have been worked by these people in both Ethiopia and Arabia, in remote time. The most energetic mine-workers of antiquity were the Phœnicians. Many

centuries before Alexander conquered the world, these commercial people had gold and silver mines in Sardinia, lead and silver mines in Spain, and tin mines in Cornwall on Briton island, while their iron and copper mines were scattered throughout the then known world.

No minerals are considered accessible that are more than 5000 feet below the surface. The internal heat increases about one degree for every 53 feet of descent. The heat a few thousand feet below the surface becomes unbearable. Ventilation and drainage are factors that must always be taken into consideration in every mine. Shafts and all permanent ways must be carefully protected by iron pillars or well-seasoned and heavy timber supports.

In the study of each mineral the following outline will be found helpful:

1. Name of Mineral.
2. Origin.
3. Distribution — by Countries.
4. How Obtained.
5. Uses.
6. Instructive Commercial Facts.

The first mineral to be considered is coal. Coal is the principal fuel used in smelting ores, in manufacturing plants, and is the principal fuel of steamboats and steam cars, as well as light, water and gas plants. Coal, for this reason, has great economic value. Coal is a compound of decomposed woody matter with inflammable gases.

Many ages ago, more than 600 species of large, fern-like plants were growing as great trees. In the course of time these fell, and before they had rotted away, were embedded in the earth. As many fossil leaves and scales of these plants are found in nearly every coal region of the world, it is believed that coal was formed from the trunks of trees and these tree-like ferns decomposing under heavy pressure. These trees were widely distributed during the warm, moist period of the earth's development called the Carboniferous age, and for this reason coal is one of the most widely distributed minerals.

Man was led first to study coal as of vegetable origin from peat. If a mass of moss and roots becomes imbedded, it forms peat. In regions where summers are not very warm and where fogs are frequent, the partial decay of large beds of vegetation forms peat bogs. Peat lands are found in Labrador, Newfoundland and Anticosti on the North Atlantic shores, with peat from three to ten feet thick. Peat bogs, within our own nation, are found in New England, northern New York, Ohio, Michigan, and Wisconsin. The most extensive peat lands are found in Ireland (one-half of Ireland is peat land), Scotland, England, Sweden, Russia, and France.

By a greater pressure and a longer process peat was changed to lignite or brown coal. Lignite, by pressure and heat, was changed into bituminous or soft coal. Added heat and still greater pressure is believed to have changed bituminous into anthracite or hard coal. Continued heat and pressure changed anthracite into graphite, which has practically no inflammable material in its composition, and therefore will not burn. Graphite is practically pure carbon, and is not classed as a coal.

Anthracite coal is very hard, breaks with a shell-like fracture, has a shiny black luster, and contains a large per cent. of carbon and a small per cent. of inflammable substance. For this reason it burns with very little flame, but with a great per cent. of heat.

Bituminous coal has a cubical fracture and though hard, it breaks more readily than anthracite, has a greater per cent. of inflammable substances, and burns with a bright flame. This coal yields, by distillation, coal tar, a thick tarry liquid like bitumen, a mineral pitch. For this reason it was named bituminous coal.

These classes of coal are not fixed, for the proportion of carbon varies from 6.4 per cent. in lig-

nite to 94 per cent. in Pennsylvania anthracite. The inflammable substances vary from 20 per cent. in lignite to 1½ per cent. in the best anthracite.

The discovery of coal occurred early in the history of commerce, twenty centuries ago. Theophrastus, a Greek scholar, wrote of blacksmiths using coal. In the twelfth century the mines of Newcastle sent ship-loads of coal to London. For this reason it was called "sea-coal" for centuries.

Father Hennepin, while exploring the Mississippi river, discovered coal 200 hundred years ago. The first coal mines in our nation were opened near Richmond, Virginia, 150 years ago. The first man to use anthracite coal was Obadiah Gore, who lived in Wyoming Valley, Pennsylvania, just before the Revolutionary War. By using his bellows he found the anthracite could be made to burn, and he then used it exclusively in his forge. Anthracite was first sold for house use by Col. Shoemaker. He sold a small quantity at Philadelphia. The buyers, failing to make the coal burn, procured a warrant for Col. Shoemaker's arrest as an impostor. They claimed he had sold them black stone for coal. It was not until the beginning of the nineteenth century that hard coal was used to any great extent.

England used to be known as the world's coal-field. The State of Pennsylvania has as much coal as not only England, but all Europe. Pennsylvania has not to exceed one-tenth of our nation's supply of coal.

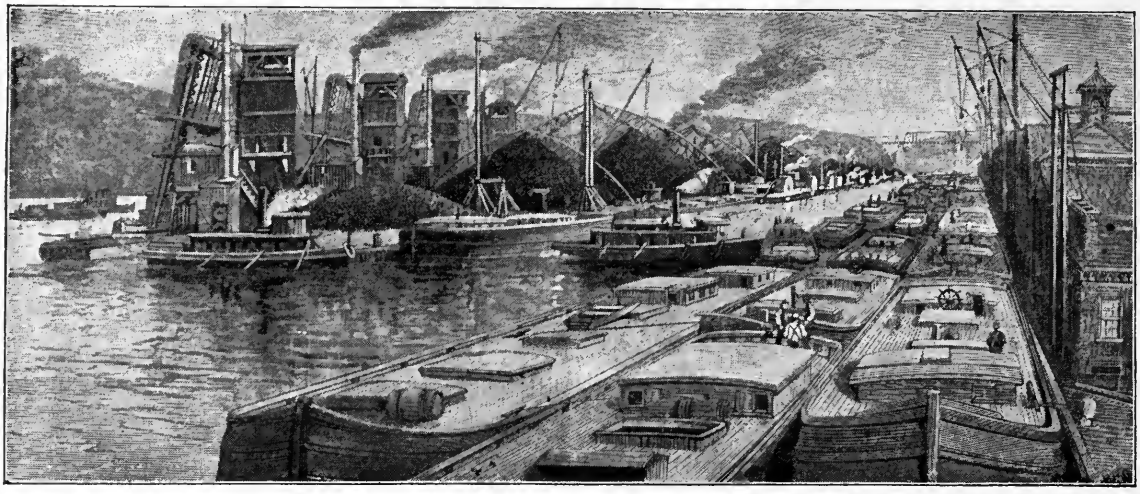
By burning out the gases of bituminous coal, coke is made. Thus coke is a refined coal. It is valued in smelting ores and the manufacture of steel for its purity. Separating the different elements of coal by heat is called distillation of coal. By distillation of coal, coal-tar, ammonia, paraffin, naphtha, creosote, aniline (a dye product), and illuminating gas are obtained.

In recent years beds of natural coke have been found, of a quality superior to artificial coke. Molten lava bursting through coal-beds is believed to have worked the change. One of the best coke-beds found is at Funikitchen, Hungary. Coke deposits have recently been discovered in Mexico. Natural coke is of a dark-gray color, and much closer grained than the oven coke.

The rise of the coal industry is considered a safe index to the world's industrial development. It is estimated that in 1860 the world's production of coal amounted to 144 million metric tons. In 1900 the world's coal-bin received 775 million metric tons. Modern industry depends upon coal and coal products for its fuel and source of power. About the time Columbus discovered America, England discovered her supply of coal and iron, and began to utilize the discovery. Shortly after this, De Gamo found the route to India via Cape of Good Hope, and the monopoly of the East-Indian trade was wrested from the Mediterranean ports. This caused their decline, while England's commerce began to develop, largely due to her great quantities of coal and iron. For 400 years England, with 12,000 square miles of coal territory, as a coal-producer led the world.

England's coal is largely shaft or deep-mine coal. These shafts are often from 2500 to 3000 feet below the surface, with veins from 1½ to 2 feet thick. The coal at the pit in England costs from 65 to 70 cents more per ton than our coal costs us. A large amount of our nation's coal is drift coal, and veins are from two to five times thicker than the English veins of coal where shafts have to be sunk.

The transportation of coal for domestic use in the United States is an important item, owing to the great distances the coal is transported. Until very recently, coal for the Pacific States had been imported from Australia. It could be carried by steamer across the Pacific cheaper than it could be transported by rail over the mountain ranges to the Pacific coast. The discovery of extensive coal-beds in Oregon and Washington has enabled these Pacific States to almost supply the home demand



Mechanical Methods of Handling Coal.

since 1900. Coal is transported from Pittsburg to New Orleans by stern-wheeled steamers towing supplemental cargoes on large barges. Often a single steamer conveys 20,000 tons of coal down the Ohio and Mississippi rivers to New Orleans, 2000 miles from the "Iron City." This tow, worked by a few men, carries as much freight as 3000 cars drawn by 100 locomotives and manned by 600 men. The cost of carrying coal by water between these cities averages less than one-half a mill per mile. This is declared to be the cheapest transportation known to the commercial world.

The cheapest and easiest coal-mining known to the mining world is in China. The coal in some parts of the empire is so near to the surface, and labor is so cheap, that it is mined for *13 cents* per ton. In both coal and iron China is a formidable competitor with England, Germany, and the United States, for the Japanese trade.

Our nation has 192,000 square miles of coal territory, and in 1899 passed Great Britain in the quantity of coal mined.

Below are the three groups of coal-producing nations. The yield of coal indicated in Group I shows the million tons for 1900; Groups II and III name the countries in rank, and give the sum total per cent. of the world's product that the entire group furnished in 1900:

I. First Order.

1. United States.....26.8

	Per cent. of Nation's Coal.
(*a*) Pennsylvania	52.0
(*b*) Illinois	11.8
(*c*) West Virginia	9.5
(*d*) Ohio	8.4
(*e*) Alabama	3.0
(*f*) Indiana	2.2
(*g*) Iowa	2.+
(*h*) Kentucky	2.0
(*i*) Wyoming	1.6
(*j*) Missouri	1.5
(*k*) Kansas	1.4
(*l*) Tennessee	1.3
(*m*) Washington	1.0
Rest of States less than	1.0

2. Great Britain.....25.2

3. Germany 15.8

These three nations produce four-fifths of the world's coal.

II. Second Order.

1. Austria-Hungary,
2. France,
3. Belgium,

} $12\frac{2}{3}$ per cent.

These three nations furnish three-fourths of the remaining fifth of the world's coal.

III. Third Order.

1. Russia,
2. Japan,
3. New South Wales,
4. India,
5. Canada,
6. Spain,
7. Transvaal,
8. Sweden,
9. New Zealand,
10. Italy,
11. China,
12. All other countries,

} 4 per cent.

The most extensively distributed of the minerals is iron. It is seldom found in nature pure. It is usually in combination with non-metals. It is an ingredient in rocks, soils, natural waters, and is also found in both animal and vegetable matter. The iron of commerce is generally obtained from its oxide and sulphide ores. England uses a carbonate known as argillaceous iron ore.

The iron of commerce occurs in three forms: cast iron, wrought iron, and steel.

Cast iron is obtained by heating the ores in a blast furnace. The iron is left in combination with a small though varying quantity of carbon. When the molten iron comes from the furnace, it flows down the hearth through a channel, into the middle of a large bed of sand. From the large channel in the middle of the bed, extend smaller ones, and from these extend the "pigs." The pigs are small sand-beds from three to four inches wide and about three feet long. At stated intervals the furnace is opened and molten iron run into the "pigs" to cool. For this reason it is called pig iron.

Wrought iron is obtained from cast or pig iron by reducing the amount of carbon to less than one per cent. This is done by means of a reverberatory furnace, which burns out the carbon and runs impurities off as slag or scoria. The metal is first formed into balls, run through a press to take out remaining scoria, and then rolled into bars. It is now the malleable iron of commerce.

Steel was formerly made by "cementation." Bars of wrought iron embedded in charcoal and inclosed in air-tight boxes were heated until the carbon of the charcoal was made to enter into combination with the wrought iron throughout. This process made the product too expensive for general use in manufactures.

During a European war in 1854, Sir Henry Bessemer began experiments in refining iron, seeking a better material than cast iron for the heavier guns then coming into use. He had a large converter made in London for changing cast iron into steel. Mr. Bessemer was eminently successful in originating a process of obtaining steel from cast iron instead of wrought iron. This Bessemer process of manufacturing steel takes but a few hours, where the "cementation" process requires days.

When Mr. A. S. Hewitt received his Bessemer gold medal in 1890, he said: "The invention of printing, the construction of the magnetic compass, the discovery of America and the introduction of the steam-engine are the only capital events in modern history which belong to the same category as the Bessemer process."

This process that has created the present age of steel is clearly shown in the following extract:

"From two to six tons of cast iron when melted is run into a large globular vessel, built of the most infusible substance. Numerous holes in the bottom of this crucible allow a strong blast of air to bubble up through the melted metal. A most violent combustion follows, the heat of which keeps the metal in a fluid state, while its carbon and a small part of the metal itself are burned to oxides. Too much carbon by this process is removed and a quantity of cast iron is added to restore carbon enough to change the whole mass into steel. (Usually steel contains from $\frac{1}{2}$ to 2 per cent of carbon.)

The crucible is then tipped upon its pivots and the molten steel run off into molds. Less than half an hour is enough to change these tons of cast iron into cast steel."

The leading nations in the production of pig iron for the year 1900 rank as follows:

1. United States.....13¾

	Per cent.
(*a*) Pennsylvania	49
(*b*) Ohio	17
(*c*) Illinois	10
(*d*) Alabama	8
(*e*) Virginia, (*f*) Tennessee, (*g*) New York, (*h*) Maryland, (*i*) Wisconsin and Minnesota, (*j*) West Virginia, (*k*) Michigan, (*l*) Missouri and Colorado, (*m*) New Jersey, (*n*) Kentucky, (*o*) North Carolina and Georgia, Connecticut, Texas, Massachusetts	Less than 3 per cent.

2. Great Britain..... 8¾
3. Germany 7
4. France 2½
5. Russia 2½

Ninety per cent. of the iron ore of our nation is furnished by the Lake Superior and the North Carolina, Georgia and Alabama ore regions. Coal is the fuel for smelting purposes, and the ore is transported to places adjacent to coal-beds. The lakes furnish cheap transportation of Superior ore, which is carried down to Cleveland and Pittsburg.

The labor-saving machinery invented within the last ten years has reduced both time and expense of mining, loading and unloading ore. Steam drills, steam shovels, traveling cranes, and friction chutes, make ore-mining and ore transportation as much a science to-day as ore-refining. At the docks of Duluth, Two Harbors, Ashland, Marquette and Escanaba, whaleback freighters carrying 6000 tons of ore have been loaded in two hours. Each of these ports ships annually two million tons of iron ore.

The world's production of steel in 1900 in million tons:

1. United States.....10.20
   - (*a*) Pennsylvania..... 60 per cent.
   - (*b*) Ohio..... 21 per cent.
   - (*c*) Illinois..... 12 per cent.
   - (*d*) Alabama, Maryland, West Virginia, North Carolina, Missouri, Colorado, Michigan, Wisconsin, Minnesota, New York, and New Jersey with a small per cent. in the order named.
2. Germany 6.30
3. Great Britain..... 4.93
4. France 1.50
5. Russia 1.00
6. Austria ..... .75
7. Belgium ..... .50
8. All the rest of the world..... 1.67

Steel is now an important element in the mechanic arts. It is used in rails, cars, bridges, frameworks of buildings, implements, household utensils, and machinery of all kinds. A nation's consumption of steel is now considered a barometer of its industries.

The greatest iron city in the world is Pittsburg, Pennsylvania. Here we find the United States Steel works with ten mill centers with a capacity equal to one-fourth of the entire world's production of steel in 1900. It owns over 18,000 coke ovens, and 80 blast furnaces. Here are also located the Westinghouse plants, established by George Westinghouse, and now employing 12,000 skilled workmen, who annually turn out thirty million dollars' worth of air-brakes, switches, electric appliances and engines of all kinds. They manufacture the largest gas-engines known to the engineering world. At Pittsburg and in its vicinity is produced 24 per cent. of the nation's pig iron, 34 per cent. of the nation's Bessemer steel ingots and castings, nearly 50 per cent. of total production of open-hearth steel ingots and castings, over 57 per cent. of the total production of crucible steel, 39 per cent. of total production of all kinds of steel, 26 per cent. of Bessemer rails, and 64 per cent. of total production of structural shapes.

Birmingham, Alabama, is our second iron city. Both of these cities have quantities of coal, coke and limestone, and this fact has located at these places many blast furnaces for making pig iron.

The blast furnaces have brought the steel interests to these iron centers. A blast furnace is cylindrical in form, and shaped like an inverted cone. It is made of solid masonry, and is from 50 to 125 feet high. The "charge" is made up as follows: To every $1\frac{2}{3}$ tons of iron ore nine-tenths ton of coke is used, to which is added one-half ton of limestone. This is poured in at the mouth of blast (top of funnel) by means of mechanical lifts worked by compressed air. Hot air is now blown up through the "charge" by engines. The hot air causes gas to form and renders more intense the heat of the furnace. The gaseous substances in the ore and limestone pass up through the "stack," and the metallic iron melts and flows down to the hearth. The limestone unites with the earthy substances in the ore and forms slag, which is drawn off at stated intervals and thrown away. It is lighter than the iron, and floats on top of the molten iron.

The Homestead steel plant is the largest one in the world. The next largest plant is at Ensley, Alabama. Within a radius of three miles of Ensley are seen all the processes, from the ore and coal to the best steel plate. A third great plant is located at Pueblo, Colorado, employing many hundred men. This plant is especially helpful, as it manufactures the steel implements used in the mining industry.

This nearness of cheap fuel to the mined ore, explains the location of coke ovens, blast furnaces, cement works, steel plants, and numerous molding-shops of cast iron.

Copper.

One of the most important metals now used in the arts is copper. The oldest mine in the Superior ore regions is a copper mine. This mine is supposed to have been operated by the Mound Builders. History tells us that the copper mines of Sinai were worked many centuries before Christ.

In the débris of centuries have been found ruins of the furnaces and crucibles used, the tools and huts of the miners, with the slag and cinders. The copper mines of Sinai and Lake Superior would indicate that copper was the first metal used by man.

Copper is found native in the Lake Superior region, Japan, China, and Sweden. The ores of copper are very abundant and quite widely distributed.

Copper, being malleable, ductile, and a good conductor of heat and electricity, is quite valuable in the mechanic arts. Alloyed with tin, it makes bronze gun-metal and bell-metal. Brass is an alloy of copper and zinc, and is next to iron in its use in the mechanic arts. German silver is an alloy of copper, zinc, and nickel.

The richest copper mines in the world are the mines of native copper along Lake Superior. The Tamarack mine has a depth of nearly a mile. The copper obtained here is often in very curious crystalline forms, sometimes in branch-like shapes similar to growing plants. In one Superior mine a mass of copper was found that weighed 400 tons.

Copper is used in household utensils, in electrotyping and electroplating, on the rolls in calico printing, for sheathing vessels, for lightning-rods, and is also quite generally used for transmitting electric energy. The very finest copper for electrical purposes is the Lake Superior copper.

The United States annually produces between 240,000 and 270,000 tons of copper. This is more than 50 per cent. of the world's output of this metal. The richest copper mines of our nation are the Calumet (Lake Superior), Butte and Anaconda (Montana) mines.

The leading copper-producing regions are as

follows: United States, Spain and Portugal, Japan, Chile, Germany, Australia, Mexico, Canada, Russia, and the Straits Settlements, ranking in order named.

Gold.

Gold is one of the heaviest and most precious of all the metals. It is sometimes found in sand, sometimes fine grains are scattered through crystalline rocks in veins or lodes, and again gold may be found in "nuggets" or large grains of free gold. The largest nugget ever found was in Australia. This is registered as weighing 233⅓ pounds troy.

$4,000,000, Gold from Nome City, in boxes.

All metals were once in a molten or liquid state. As the earth's crust cooled, the metals were believed to have collected in mass forms. These metal centers were broken up by the disintegration of the rocks and upheaval of the mountains. In this way gold particles are believed to have been washed into the valleys, where they became imbedded in the gravel and sand of rivers. The gold is obtained by washing; this washing process is called "placer mining." Where the gold is scattered through gold-bearing quartz, mercury is mixed with the crushed ore, dissolving the gold. The mercury is later separated from the gold by filtration and distillation. This process of amalgamation is generally used to obtain the gold from its ore.

Gold is prized for its color and its beautiful luster, as well as its intrinsic value, which is approximately $300 per pound. On account of the slight fluctuations in its universal value, gold is the standard money of many nations. Pure gold being too soft to use in coins, it is alloyed with copper. Twenty per cent. of the world's output of gold is used in the arts.

The leading gold-producing States are Colorado, California, South Dakota, Montana, Utah, Arizona, Nevada, Idaho, Oregon, New Mexico, Washington. The Territory of Alaska, with its Klondike and Cape Nome gold fields, raised our output of gold to nearly eighty million dollars' worth per annum.

In 1883 gold was discovered in the Transvaal in South Africa. The product rose from $50,000 in 1884 to $55,000,000 in 1898. The Boer-British war since that time has greatly reduced the output of the Transvaal mines, which are believed to be the richest gold mines in the world.

The world's total output of gold for 1900 was $257,000,000, nearly $50,000,000 less than the previous year, due largely to the South-African war.

The greatest gold-producer is the United States, with Australia, Russia, Canada, Mexico and India following in order named. The South-African mines are not considered in this tabulation, their output being reduced 80 per cent. by the war now being waged in that section. The Camp Bird mine, on Mt. Sniffles, near Ouray, Colorado, employs 500 miners, and yields its owner, Mr. Walsh, $3500 gold bullion per day, according to the U. S. mint records at Denver. Mr. Walsh is believed to have the richest gold mine this side of Nome City, Alaska.

Silver.

Silver, like gold, is a precious metal, and was known as a money metal 2000 years before Christ. To-day it is a coin metal in all civilized nations, and the money standard in some of them.

Silver has a brilliant luster, is malleable and ductile, and is a widely distributed metal. It has strong affinity for both sulphur and chlorine, and therefore is quite largely found as a sulphide or chloride ore. Silver has been found free or native, and also alloyed with gold.

Masses of native silver from 50 to 500 pounds in weight have been found in the mines of Norway, Saxony, Bohemia, Hungary, Peru, and Mexico. These instances are rare, however, as native silver usually is not found in such large masses.

Silver is much used in metallurgy, in vases, table-ware, jewelry, and in silver leaf, by painters and decorators.

The principal silver States and Territories of our nation are: Colorado, Montana, Utah, Idaho, Arizona, Nevada, California, New Mexico, Texas, and Washington, in the order named. The world's silver output for 1900 was the largest in history of silver commerce — 179,000,000 ounces troy. The United States led the world, producing 59½ million ounces troy; while Mexico, Australia, Germany, Bolivia, and Spain are other great silver-producing countries.

Wheeling Salt to the Stacks, Salt Fields of Solinen, Russia.

Other Mineral Products.

The leading nations in other mineral products are given according to the statistics for 1900:

Mercury (quicksilver).— Spain, United States, Austria, Mexico, Russia.

Zinc.— Germany, Belgium, United States, France.

Lead.— United States, Spain, Mexico, Great Britain, Sweden, Germany, France, India.

Tin.— Straits Settlements, Banca, Bolivia, Great Britain, Tasmania.

Nickel.— New Caledonia, Canada.

Platinum.— Russia. (Used in chemical apparatus. Ninety per cent. of the world's output comes from Ural mountains.)

Salt.—United States, Great Britain, Russia, Germany, France, India, Austria, Spain.

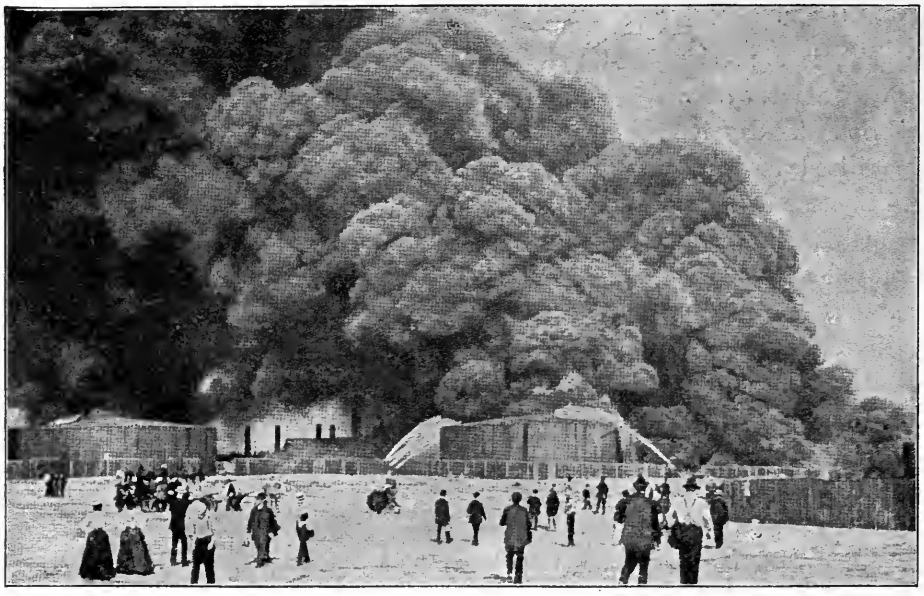
Sulphur.— Sicily, southern Italy, Mexico, Central America, and all important volcanic regions.

Aluminum.— The United States furnishes 50 per cent. of world's output. A refining process since 1888 has reduced its cost, $8 to $10, to 30 and 40 *cents* per pound.

Mineral Fertilizers.— Phosphates from Florida, South Carolina, and Tennessee; nitrates from Chile.

The clay products of the United States alone amount to nearly sixty million dollars annually. England, France and Germany also have extensive plants manufacturing stone- and china-ware, brick, sewer-pipe, drain-tile, and pottery of all kinds.

Slate is a rock easily split into layers, and is much used for roofing, mantels, blackboards, slate-pencils, etc. The richest quarries are found in



Oil Tanks on Fire

Wales. In our own country the largest quarries are in Pennsylvania, but the finest quality of slate comes from Vermont.

Marble is crystallized limestone, and is much prized as a building-stone because it takes a high polish. It is much used in statuary, monuments, and as a building material. The finest quarries are in Italy, the islands of the Mediterranean sea, and the United States. Vermont, Georgia, Tennessee and New York are the leading States in the marble industry in our nation, ranking in order named.

Petroleum or rock-oil is obtained from the earth as a dark, viscous liquid. While it was known to the Asiatics and ancient Greeks, no special use was made of it until the middle of the 19th century, when oil was found near Titusville, Pennsylvania, in 1859. Since then the world's most important lubricating oils, aniline dyes and stains, kerosene, benzine, naphtha, gasoline, paraffin and scores of other commercial products are distilled from petroleum. There are more than 200 valuable by-products of petroleum.

The crude oil is now being used as a fuel on lines of railway and in mechanical shops. The great oil fields of our nation are principally in Pennsylvania, California, Kansas, and Texas.

The oil industry has grown to be one of the great industries of the world. The greatest oil-producing regions are found in the United States, and in Caucasia, between the Black and Caspian seas.

The study of refining petroleum, pipe-lines, oil-tank centers, tank steamers and our nation's kerosene commerce may here be profitably taken up.

TIMBER COMMERCE.

Bark Products.

A. *Cork.* The cork tree of commerce is a species of live-oak (*Quercus suber*). This tree is one of the few trees in nature that yields its bark and retains its life. It is the outer bark that furnishes the cork of commerce. It is through the inner bark that most of the sap courses, and strippers are careful not to remove this. The bark of the cork oak is not valuable to commerce until the tree is twenty years old. The cork improves in texture with each stripping, which is made at periods from eight to ten years apart. The cuticle or outer bark used varies from half an inch to three inches in thickness.

The stripping is usually done in the dryest midsummer month. This is usually June in regions of cork-oak groves. The trunk and main branches of a cork tree yield from 50 to 500 pounds of cork bark. The amount varies according to the age of tree, character of growth, and number of the stripping. The sap in the bark is partially evaporated by exposure to sun and air for several weeks, and the rest is extracted by boiling. This latter process softens and flattens the bark. The woody exterior that cannot be used is now scraped off and the cork made ready for shipment to the nearest cork warehouse. Here the cork is baled according to thickness and quality. These bales are made as compact as possible, and bound with hoops of steel or wire. They are now shipped to the world's cork factories to be worked up into bottle-corks of all sizes, insoles, bicycle grips, life-preservers, linings for hats and helmets, pipe covering, and many other useful things. The cork scraps are ground and put through a consolidating process, becoming the granulated cork of commerce. This is much used in the making of linoleum and lining of refrigerators.

The principal cork-oak groves are found in Spain, Portugal, Algeria, and Morocco. The two largest cork factories in our nation are situated at Pittsburg, Pennsylvania. One of these factories works up nine million pounds of cork bark annually. Cork is now an indispensable element in the manufacturing world.

B. *Cinchona Bark.* The cinchona tree is a native of Peru and Ecuador, but is now being cultivated in the East Indies. Cinchona plantations were started in Java by the Dutch Government in 1852. These plantations now supply two-thirds of the quinine of commerce. The English Government has established cinchona plantations in India that are now yielding a profitable revenue.

The cinchona is an evergreen tree, and numbers more than twenty species. Only a part of these yield commercial cinchona. Certain substances called quina, cinchona and quinidine exists in the inner bark of these trees. Quina, from which quinine is obtained, is the most useful of these substances, and stands, next to opium and calomel, the most important of all drugs. The people of the United States are said to use one-third the quinine of the world, more than one and one-half billion grains being imported annually.

C. *Caoutchouc*, or *Gum Elastic*, is the sap of the inner bark of certain trees growing in South America, the East Indies, and Mexico. The tree is tapped by boring a hole in the trunk, and a clay cup is placed beneath each incision. This fluid is thick and yellowish-white at first, but hardens and darkens as it is exposed to the sun. The collectors generally hasten the drying process by heating over a fire, which gives caoutchouc its black appearance.

Mr. Goodyear, of New York, in 1844 invented the art of vulcanizing rubber, whereby caoutchouc loses its adhesive qualities, is not affected by change of temperature, and retains its desirable elastic

qualities. This is done by mixing sulphur with the caoutchouc and subjecting the whole to great heat.

Electrical appliances and water-proof goods have greatly increased the demand for rubber.

The total world output in 1900 was 57,500 tons, obtained from the following sources:

	Amounts in Thousand Tons.
Amazon District of South America	25
Rest of South America	3½
Central America and Mexico	2½
East and West Africa	24
East Indies	1
Madagascar and Mauritius	1
India and Ceylon	½

The manufactories of the United States and Canada annually use 21,000 tons; Great Britain, 21,000 tons; the rest of Europe, 15,000 tons.

Gutta-percha is the milky juice of a tree of India and the Sandwich Islands. It is similar to caoutchouc, and is quite largely used to cover submarine cables, and in the arts.

"The barks of these three trees yield more real value to man than all the jewels and precious stones ever dug from the earth," for they give him health, wealth, and luxurious comfort.

Gums and Resins.

A. *Gums.* Gums are exudations from trees, arising from a change of tissue in the tree. They are quite largely used in stiffening fabrics and in the manufacture of mucilage and inks. The most important gum of commerce is obtained from a species of acacia tree growing in Africa, Arabia, Australia, and other countries. The gums are named from the countries producing them; as, gum arabic, cape gum, gum Senegal, Australian gum, East India gum, gum of Bassorah, and Persian gum, or gum tragacanth.

B. *Resins.* The resins are widely distributed, and are found not only in trees, but in nearly all groups of plants. The gums are carbohydrates, but the resins are hydrocarbons, and contain volatile oils, resinous acids, cellulose, tannin, and many carbonaceous substances.

(*a*) Gamboge is a resin obtained from a small tree growing in Ceylon, Siam, and Cambodia. It is largely used in coloring varnishes, is the yellow of water-colors, and has a medicinal value. The plant bears a luscious fruit.

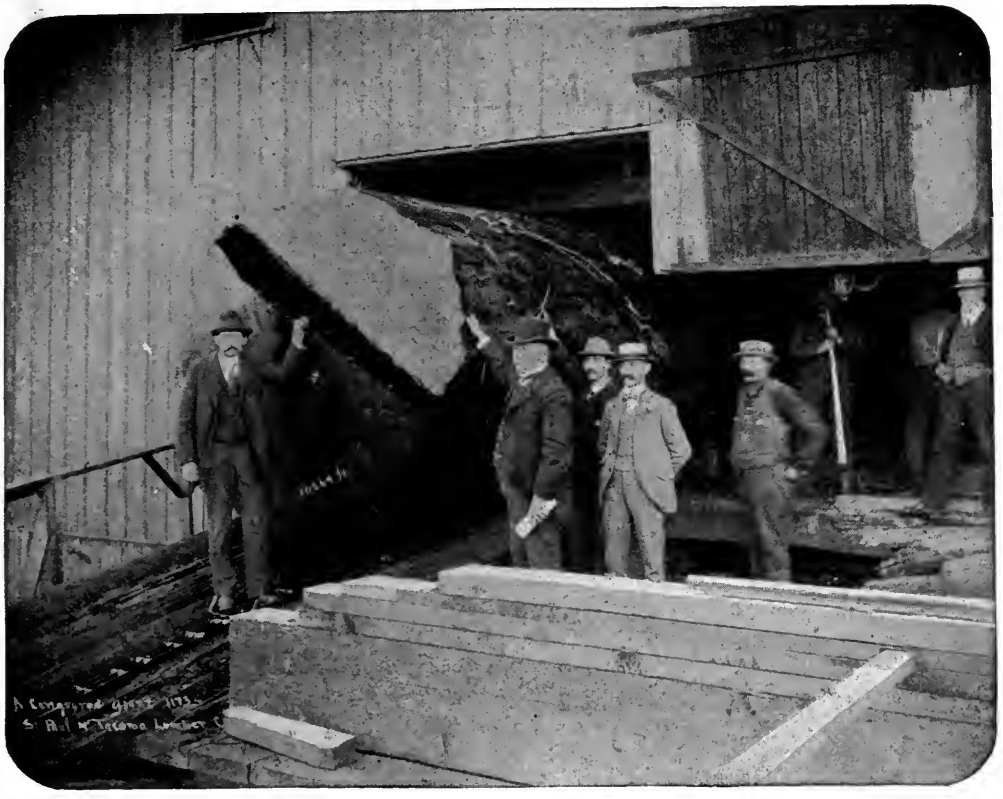
(*b*) Asafœtida is obtained from two plants in the parsley family. These plants grow in southwestern Asia, in the region extending from the Aral sea to the Persian gulf. The plants are from six to seven feet high, and often form vast forests. In the east the resin is pulverized and used as a condiment for flavoring sauces and foods. It has a commercial value as an important drug.

(*c*) The turpentines of commerce are principally obtained from coniferous trees growing in Europe and North America. The turpentine is found in the inner bark and in the wood. The finer kinds are thin and clear, and are used in medicine. The poorer kinds of turpentines are thick and cloudy, and are used in the manufacture of varnish, resin, sealing-wax, soap, and many other substances. Resin is the mass left after the volatile oils have been driven off by distillation. Tar is largely obtained from the roots and wood of turpentine trees. From tar are obtained pitch, oil of tar, creosote, paraffin, and aniline. Turpentine "farms" are extensively worked in our South Atlantic and Gulf coast States. The business of "yarding" and stripping the resin products of the long-leaf pine belt is the principal industry of many cities of this region.

Myrrh is a resin obtained from a small tree growing in Arabia. It is one of the oldest medicinal articles known. The odor is pleasant and the medicine is much used in the East.

Balm of Gilead, or Mecca balsam, is also obtained from an Arabian tree of the myrrh family. It is largely employed in the manufacture of perfumery and in medicine. The Turks use it in ointments and cosmetics.

The finest of all turpentines is obtained from the balsam fir. It is called Canada balsam, and is much used in microscopy and the arts.



A Washington Sawmill.

Mastic, sandarac, gum lac, copal and balsam of tolu are important commercial resins.

(*d*) "Kauri gum" is believed to be a fossil resin of the kauri tree of New Zealand. Whole forests of this tree are believed to have once covered northern New Zealand. The ravages of fire and natural decay gradually, through the centuries, killed out the trees, and the fossil resin found in great quantities five or six feet underground is thus accounted for. The exudations of living trees have no commercial value.

Camphor.

This is a commercial product of a species of laurel tree growing in China, Japan, and Formosa. The tree is cultivated in these countries for ornament as well as its commercial product. Japanese law now requires that a camphor tree be set out for every one cut down. In one village in western Japan is a group of thirteen camphor trees about 100 years old, so well proportioned and beautiful that they are the pride of that region. Camphor trees have been found fully fifteen feet in diameter and 300 years old. In obtaining camphor the trees are cut — roots, stems, trunk and all — into chips and boiled. The sap and oil are thus extracted from the wood, and going up with the steam, dome-shaped covers collect the vapor, which is conveyed to a condensing vessel. The oil is pressed out of the deposit obtained, and leaves the camphor gum of commerce.

Lumber.

The greater part of the world's lumber comes from Canada and the United States. The principal trees from whose saw-logs lumber is made are

pine, cypress, fir, spruce, cedar, hemlock, oak, hickory, walnut, maple, elm, ash, poplar, sycamore, cottonwood, beech, birch, chestnut, cherry, California redwood, rosewood and mahogany of the tropics, ebony of Madagascar and Ceylon, the jarrah woods of Australia, and the kauri trees of New Zealand. The greatest lumber-producers of Europe are Russia, Sweden, Norway, and Austria. The lumber regions of North America are Canada, United States, and the West Indies. Argentine and Brazil represent the forests of South America. Australia and New Zealand are also important lumber-producers. The largest output of lumber in our nation is from the Great Lake region. For this reason we find the center of the American furniture and vehicle industries here, near the chief source of raw materials. Michigan leads in the production of lumber and shingles. The other lumber States of this region are Wisconsin and Minnesota. Saginaw, in 1890, was the lumber center of our nation, but the cutting away of forests in advance of the young timber in the eastern portion of this timber-belt has reduced Saginaw's lumber commerce, and to-day Minneapolis is the lumber city of our nation, and is believed to be the greatest lumber market in the world. The yearly lumber commerce of this city is nearly 600 million feet.

The domestic freight traffic of our nation for a year aggregates as follows:

Products of agriculture, 50 million tons.
Products of animals, 13 million tons.
Products of mines, 227 million tons.
Products of manufactures, 50 million tons.
Merchandise, 20 million tons.
Lumber, 48 million tons.

Next to coal, lumber is the greatest single element of domestic commerce of our nation.

The by-product of the saw-mills is utilized in the paper-pulp, toothpick and spool industries. Along the Penobscot river in Maine are many mills, grinding millions of feet of small logs into pulp, and from this product manufacturing paper. In Maine are also located the nation's greatest spool factories. These factories furnish the spools for the thread-mills of England and the United States. Over 90 per cent. of the wooden toothpicks used in our nation come from Franklin county, Maine, and are made of white birch. The principal toothpick factories outside of Maine are in New York, Pennsylvania, and Massachusetts. The best toothpicks made in the world come from Portugal. They are whittled out of orangewood by peasant girls.

Canada has the largest spruce forests in the world. In the forests of Canada are located many large saw- and pulp-mills. The former turn out millions of feet of lumber, while the latter turn out thousands of tons of pulp, many mills having a capacity of 250 tons of pulp per day. Canada has 121 species of native trees, 26 being of great commercial value. Canada's forest area is so great that it was awarded the leading country in forest resources by the Paris Exposition in 1900.

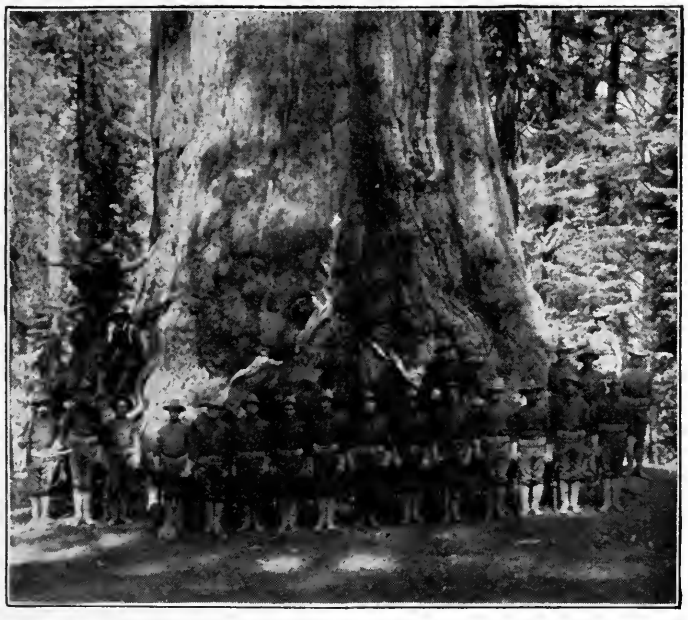
The per cent. of forest land in the total area of each State in the Union is here given in order of rank:

1. Arkansas	84	20. Idaho	42
2. Maine	79	21. Rhode Island	40
3. Alabama	74	22. Connecticut	39
4. North Carolina	73	New York	39
West Virginia	73	23. Delaware	36
5. Georgia	71	24. Colorado	32
Washington	71	25. Indiana	30
6. Mississippi	70	26. Montana	29
Florida	70	27. Texas	24
7. South Carolina	68	28. Ohio	23
8. Michigan	67	29. Arizona	22
9. Minnesota	66	California	22
10. Tennessee	65	30. District of Columbia,	20
Indian Territory	65	31. New Mexico	19
11. Louisiana	62	32. Illinois	18
12. Missouri	60	33. Utah	13
13. Wisconsin	58	Wyoming	13
Virginia	58	Iowa	13
New Hampshire	58	34. Oklahoma	11
14. Oregon	57	35. Kansas	7
15. Kentucky	55	36. Nevada	6
16. Massachusetts	52	37. Nebraska	3
17. Pennsylvania	51	South Dakota	3
18. Maryland	44	38. North Dakota	1
19. Vermont	43	The whole United States (including Alaska)	37
New Jersey	43		

Geographical divisions of timber-belts in our nation in order of commercial importance:

Rank.	*Name.*	*States Included.*	*Kind of Lumber.*
1	THE LAKE REGION.....	Mich., Minn., Wis., Ia., Ill.	White pine and hemlock.
2	THE SOUTHERN REGION...	Va., N. C., S. C., Ga., Ala., Fla., Miss., Tex., Ark., Mo., Tenn., Ky., W. Va.	Long-leaf pine, short-leaf pine, cypress, and the hard woods.
3	NEW ENGLAND AND NORTH ATLANTIC STATES.....	Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Del., Penn.	Spruce, birch, hemlock, of Me., pine, hickory and oak, of the rest.
4	THE CENTRAL REGION....	Ohio, Ind., part of Ill.	Hard-wood lumber.
5	THE PACIFIC REGION	Alaska, Wash., Ore., Calif.	Redwood of Calif., fir, cedar, and pine.
6	ROCKY MOUNTAIN REGION.	All the Rocky Mountain States.	Pine, aspen, cottonwood, and spruce.

On account of the spoliation of vast areas of American forests the Federal Government has inaugurated a systematic policy to preserve, protect and develop forest reserves. Within the last ten years thirty forest reserves have been made by the Government and placed under the care of the General Land Office. These reserves aggregate sixty million acres of forests lying in the States of Arizona, California, Colorado, Idaho, Montana, Washington, Oregon, New Mexico, South Dakota, and Wyoming. In this way the Government seeks to secure the preservation of our forests and increase the commercial supply of timber.



Largest Tree in Amer ca—Grisly Giant, Mariposa Grove, California.

Papyrus, from which Paper was first made and takes its name.
China.

ECONOMIC PLANTS.

It is estimated that of the more than 150,000 species of plants growing on the earth, 4200 are used for commercial purposes. These supply food, provide shelter, furnish fiber for clothing, are useful to the mechanic arts or give valuable medicinal elements. Some of the most important plants are named below, and their location and use to man indicated.

Grasses.

Grasses grow wherever there is found sufficient soil, moisture, and warmth to sustain plant life. The most widely cultivated member of the grass family is —

1. *Rice.* This is a staple food of nearly one-third of mankind. It grows in subtropical and tropical regions, thriving best in low, marshy lands along the seacoast. The food product is the berry, while the straw is used in the manufacture of paper.

2. The *Cereals* furnish the grains of commerce, and are largely used for food for man and beast in the temperate zone regions.

(1) Wheat is a native of Asia, but was brought to South America in the sixteenth century. From there it has been carried to all of the Americas. Wheat is now grown from the subpolar to the subtropical regions, in both the Occident and the Orient.

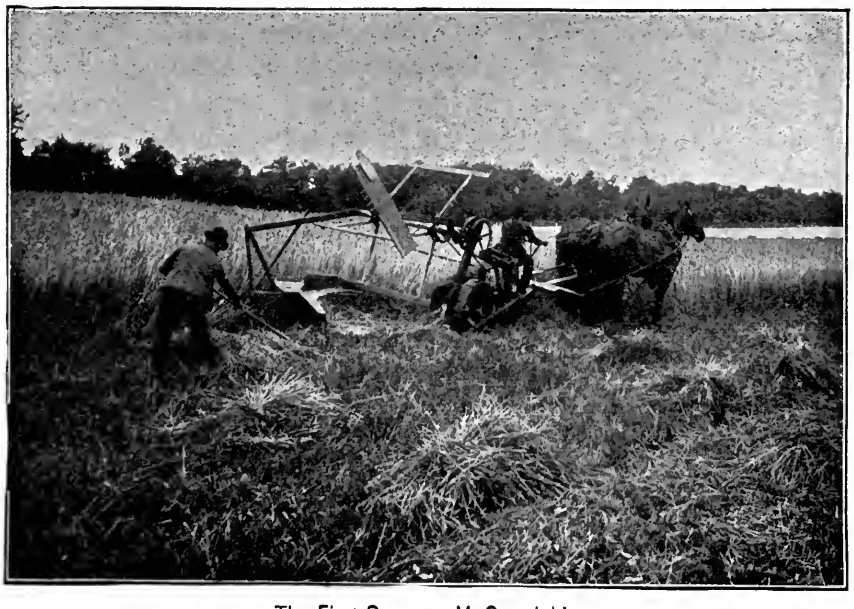
Within or contiguous to the great wheat-belts are found flouring-mills that grind the wheat kernels and separate the product into *bran, shorts,* and *bolted flour.* By a certain process is made the whole-wheaten or "Ralston" flour. A large number of breakfast foods are now being made from wheat; the largest mills of this industry being located in the United States, in the northwest wheat-belt region. Wheat for either flour or breakfast-food purposes is graded at the grain elevator, and numbered as to quality; all the very best for flour

purposes rating No. 1, the next No. 2, and so on. This grading is marked on the bins in the elevators, and the wheat is sold to the mills or foreign dealers by grade as No. 1, No. 2, or No. 3 wheat. Very large wheat elevators are found not only at Minneapolis and Chicago, but at Buffalo, where the lake freighters must transfer their cargoes to canal-boats or cars for the Boston or New York shipments. This is done through the machinery of the elevators.

The fifteen greatest wheat States of our Union in 1900 are here named in order of rank: Kansas, Minnesota, California, Texas, Pennsylvania, Nebraska, Iowa, Washington, Missouri, South Dakota, Illinois, Maryland, Oklahoma Territory, Tennessee, and Oregon.

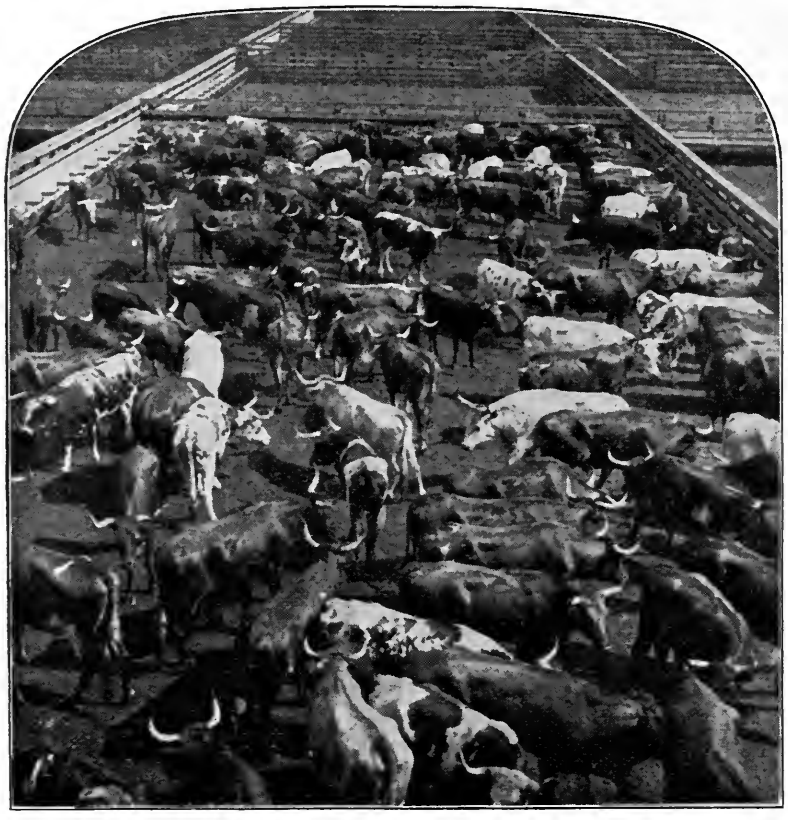
The Largest Hop Market in the World, Nürnberg, Bavaria, Germany.

(2) The Indian corn or maize crop is a very important one since science has opened so many valuable uses for corn. This cereal is a native of America, being cultivated by the Indians when Columbus discovered the New World. The explorer took back some samples of this grain to Spain. This nation later introduced the cultivation of this cereal to the rest of Europe.



The First Reaper—McCormick's.

In America this is an important food element for man and beast, but in Europe until quite recently it was only used as a food for stock. Now, corn meal is being used in rye- or wheaten-flour mixtures by peasants. It is a cheaper and more nutritious food than the proverbial "black bread." Science has proven that the pith of the corn-stalk is the most service-



In the Great Union Stock Yards, Chicago, U. S. A.

able "padding" that can be placed underneath the nickel-steel armor-plate of war-vessels. It swells when wet, and this quality renders it valuable should a ball pierce through the plate, as the pith will swell to fill the hole made by the ball and keep the water from rushing in, while it forms a spongy bed to break the force of the bullet. This corn-pith padding is used in sheets four inches thick underneath the armor on all modern war-ships. The corn-stalk fiber furnishes the very finest of cellulose obtainable. From the kernel so many different foods can be obtained that our Government sought to increase the sale of this cereal in Europe, by publishing the different ways in which corn can be used as a table food. A corn-book of 120 recipes was published, and corn kitchens established in European expositions to show how to cook and serve corn foods.

The manufacture of glucose from corn has changed the importation of European glucose and grape-sugar of several million pounds in 1884 to an important article of export commerce for our nation in 1900, since 200 million pounds are exported at the present time, and many millions more are consumed in domestic uses. Great Britain alone purchases 160 million pounds of corn glucose from our factories yearly. The principal products of the glucose factories that are being found of great commercial value are here given:

(*a*) *Glucose,* used by refiners of table syrups, manufacturers of jelly, confectioners, and brewers.

(*b*) *Sugars,* used by ale and beer brewers and apothecaries.

(*c*) *Starches,* used by cotton and paper manufacturers, baking-powder manufacturers, confectioners, and laundrymen.

(*d*) *Refined Grits,* used in place of brewers' grits with satisfactory results.

(*e*) *Flourine,* used by mixers of flour, without detriment, save that a corn product takes the place of a wheat product.

(*f*) *Dextrines,* used by fine-fabric workers, paper-box makers, mucilage and glue makers, confectioners, and apothecaries.

(*g*) *Stock Foods:* Gluten meal, corn bran, mixed feed, and corn oil-cake.

(*h*) *Corn Oil,* used by table-oil and lubricating-oil mixers, paint manufacturers, textile-fabric makers, and leather dressers. From the corn oil, by a vulcanizing process, a rubber substitute is obtained. This corn rubber can be adapted to all

the uses to which Para or India rubber is put, from bicycle tires to linoleum. The five refineries of corn oil now in our nation annually consume twenty million bushels of corn.

Distilling spirits from corn is a larger industry than the glucose manufactories. The new smokeless powder mills use corn spirits in the manufacture of smokeless powder, and Great Britain, Japan, France and Germany are buying thousands of barrels of corn spirits for their powder-mills.

These new uses of corn not only increase the acreage, but enhance the value in the market of this staple crop of our nation.

The fifteen States that are the greatest producers of corn in the United States are given in order of rank for the crop of 1900: Illinois, Iowa, Nebraska, Missouri, Kansas, Indiana, Texas, Ohio, Tennessee, Kentucky, Georgia, Arkansas, Alabama, North Carolina, and Wisconsin.

A Barley Harvest, near Bethlehem, in Judea, Palestine.

(3) Rye is found wild in the arid regions near the Caspian sea. It grows in regions too cold for wheat, as well as in the more temperate climate. It is the principal grain food of many people in northern and central Europe. The "black bread" of the German and Russian peasants is made of rye. This grain is extensively used in making whisky and the straw is used for plaiting.

(4) Oats, Dr. Johnson defined as "a grain used to feed horses and Scotchmen." It is supposed to be a native of Asia, and grows best in the cooler regions of the temperate zone. Russia, United States, Germany, France, Great Britain, Austria, Canada, Sweden and Denmark are the principal oat regions, ranking in order named. Oat-meal is so extensively eaten in our nation that many large oat-mills have been built, rivaling the capacity of many flouring-mills.

(5) Barley grows wild in Sicily, parts of Asia, and in some regions of the United States. Barley is the hardiest of all the cereals. It is not only an article of food, but is extensively used in the manufacture of ale, porter, and beer. The kernel is steeped in water until it sprouts. It is then quickly dried in a hot dry-kiln, and becomes the malt of commerce, from which all malt liquors are made. Barley can be raised in regions too hot for wheat and too cold for rye or other cereals. The leading barley nations are Russia, Austria, Germany, Great Britain, France, Canada, Norway, and the United States.

(6) Buckwheat is a native of Asia. It was brought to Europe by the Saracens, hence on that continent it is quite generally known as Saracen wheat. The kernel resembles a beechnut, and its common name is believed to be a corrupted form of "beech wheat." Buckwheat flowers profusely, and the flower contains a large per cent. of honey. This makes it an important plant in bee culture. The kernel is valuable for the large per cent. of

Tyrolese Haymakers, Val Ampezzo, Austria.

starch which it contains. It is not a wheat, although the kernel is ground into flour and used to make the "griddle-cakes" of winter, used in northern climes. Buckwheat will grow on poor soils, matures rapidly, and does not exhaust the soil. It is raised in Russia, Germany, France, Spain, England, Tartary, Egypt, and the United States.

3. *Sugar Cane* is a native of Asia. It now grows in all warm regions. The plant is perennial, yielding a good quality of sugar until eight to ten years old. Then the tops of the old canes are cut off and planted, forming a new plantation. The canes grow from three to twelve feet high, and the pith contains a sweet juicy substance. When the canes are matured they are cut down and the juice removed, boiled and crystallized as the cane sugar of commerce. The native sugar is of a yellowish-brown color, and the juice that remains in a liquid state after the brown sugar has crystallized is the molasses of commerce. By the use of chemicals and processes of remelting and molding, the various grades of loaf, granulated and powdered sugars of commerce are obtained. One of the largest sugar refineries of the United States is situated at New Orleans. That makes New Orleans a world sugar mart. A single plantation and manufacturing company has three groups of sugar mills in Louisiana, and averages twenty million pounds of sugar and 500,000 gallons of molasses yearly. The largest sugar refinery in the world is situated on East river, Brooklyn, New York. It covers five city blocks. The most important cane-sugar plantations are in the West Indies, the Gulf States, and in Hawaii. The best canes are raised in the West Indies, yielding 35 per cent. more sugar than either Hawaii or Louisiana cane.

4. *Bamboo* is a kind of tree-like grass found in southern Asia and in the West Indies as well as the East Indies. It often grows to a height of forty to fifty feet, and in diameter may vary from a few inches to four and even five feet. The seeds of this plant are edible, although it requires thirty years for the plant to reach the blossoming period. A famine in certain Oriental districts is sometimes averted by the general flowering of this grass. In one bamboo jungle, that flowered in 1864, 50,000 came to the jungle and camped for weeks, gathering the seeds for food. The bamboo is the national plant of China, where its young shoots are boiled, dried, and made into sweetmeats by confectioners; the roots serve many purposes, while the hollow stem is the staple lumber and tiling of their domestic commerce. It is the principal constructive material for houses, masts of ships, water-pipes, canes, furniture, water-wheels, pens, and many other useful articles. While Asia shows over 100 species, Africa shows but one, America one, and

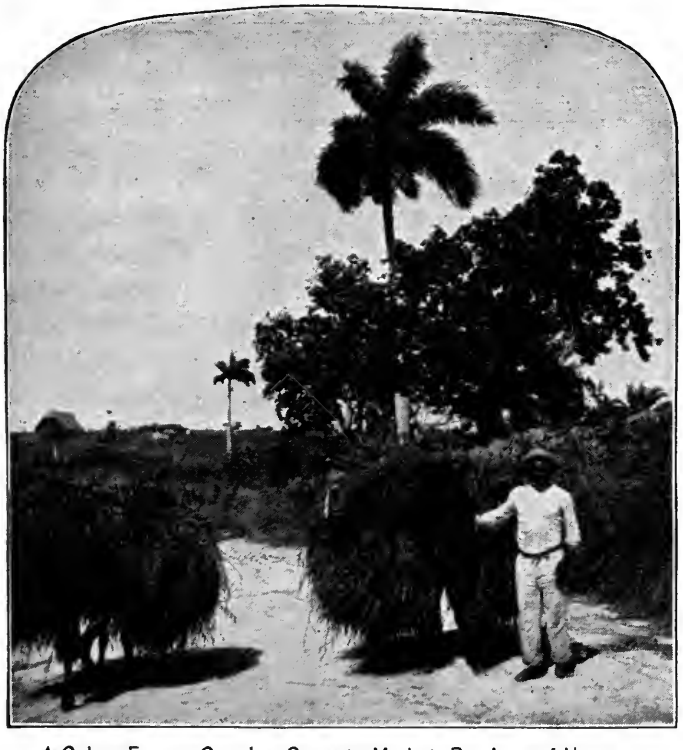
Europe none. Many cities of Burmah are built exclusively of bamboo — like Rangoon and Prome.

5. *Hay Crops.* There are a great many grasses that are used for hay, but probably those of greatest commercial value are clover, alfalfa, timothy, Hungarian grass, and wild or prairie grass. The hay is compressed into bales, and in this way reaches the great arteries of trade. It is the most important of "rough feed" for stock known to commerce.

The nation's hay crop for 1900 numbered 50 million tons, valued at 445 million dollars. The fifteen leading hay States were as follows (the yield in thousand tons):

1.	Iowa	5,006
2.	Kansas	4,031
3.	New York	3,351
4.	Missouri	2,768
5.	California	2,708
6.	Pennsylvania	2,672
7.	Nebraska	2,639
8.	Illinois	2,119
9.	South Dakota	2,064
10.	Colorado	1,781
11.	Michigan	1,727
12.	Oregon	1,677
13.	Indiana	1,663
14.	Ohio	1,652
15.	Minnesota	1,423

The Hay Market, Galway, Ireland.



A Cuban Farmer Carrying Grass to Market, Province of Havana.

The Palm Family.

This family ranks second in the commercial importance of its products, and numbers 1000 species. There is scarcely a species that is not in some way useful to man. The home of the palm is within the tropics, in regions of great heat and abundant moisture. One species of palm is native to southern Europe and four are native to our Southern States,— the cabbage, saw, blue, and dwarf palmetto trees. These five species are almost the only ones in this large family that are found beyond the tropics. The palm wood is used for building purposes; the leaves to make thatched roofs, fans, mats, hats, and use-

Cocoanut Trees in the White Sands of Florida.

ful house-utensils; the fiber for clothing and paper material; and the fruit is a highly nutritious food.

The *Sago* of commerce comes from a palm that grows in Siam and the East-Indian Archipelago. This palm is from thirty to fifty feet high. The stems of these palms contain a soft white pith. This is treated mechanically, yielding starch grains. These starch grains on being treated are converted to a paste, the sago of the market. This Caryota palm has leaves that yield a fiber much used in making ropes and mats, while its flower-spikes yield wine and sugar.

The *Rattan Palm* of the Malay peninsula grows from 100 to 300 feet high. Its fruit is edible, while its stem is used by the natives for many purposes; Europe and America use the canes in chairs and sofas and for walking-canes.

The *Peach Palm*, a native of Venezuela, yields a fruit that is an important food element in the region where cultivated.

The *Date Palm* is one of the most important members of the palm family. It is found in Egypt, Asia Minor, Persia, and China, principally. Our nation annually imports from fifteen to twenty million pounds of dates. Great Britain, Turkey, British East Indies and China furnish us with most of our dates.

The *Cocoanut Palm* stands at the head of this great family of useful plants. Every part of this tree — roots, stem, leaves, and fruit — is useful to man. It thrives best along the seashore and the islands of the Indian ocean; and the tropical regions of the Pacific and Atlantic oceans are centers of cocoanut commerce. These palms begin yielding cocoanuts when six to eight years old, and continue yielding fruit, on an average, for sixty to sixty-five years. The average yield is 75 to 100 nuts per tree each year. These nuts furnish food for millions of people, and the albumen of the nut contains a valuable oil used in soap and candle manufactories. These two facts make this nut an important article in the world's commerce. Many of the Pacific-islanders remove the albumen of the cocoanut and dry it in the sun, and sell it as copra or dried cocoanut meat. It usually takes from 75,000 to 80,000 nuts to make one ton of copra. Our nation annually imports from 600,000 to 800,000 of these nuts. For the past few years our chief sources of supply have been the West Indies, Colombia, Honduras, Nicaragua, and French Oceanica.

The Tuber Family.

This includes many common garden vegetables — the beet, turnip, radish, parsnip, carrot, onion, the indispensable potato, the yam, and the manioc or manihot.

The *Beet* of commerce is the sugar beet, the juice of this tuber yielding from 12 to 18 per cent. of sugar. Napoleon Bonaparte introduced into France the manufacture of sugar from beets. To-day more than half the world's sugar is obtained from the beet. By dialysis or diffusion the sugar molecules in the beet are obtained, and the use of steam-pipes, the vacuum method and the centrifugal machine has greatly reduced the time and expense of sugar-making and refining. There are many large beet-sugar factories, located principally in California, Nebraska, Utah, and Virginia. Tall upright cylinders, each with a capacity of two to three tons, are filled with sliced beets. Eight of these cylinders constitute a series. By the diffusion process the molecules of sugar are obtained, and the water that finally flows from No. 8 contains the sugar procured from the whole series. A ton of beets yields from 260 to 280 pounds of pure sugar. The capacity of the American factories is from 30 to 300 tons of beets per day. The mangel-wurzel (*Beta maritima*) is the sugar beet.

The *Potato* is a native of America, and was cultivated by the Andean Indian governments long before Columbus discovered the New World. Sir John Hawkins is said to have brought the potato to England, in 1563. It took nearly one hundred years to teach European nations that the potato was a valuable article of food. To-day it is Europe's largest food crop. At a European centenary exposition in 1886 there were shown the varieties of potatoes cultivated in Europe. They numbered 500 species. On account of this tuber being a staple crop of Ireland, soon after its introduction into Europe it was named the Irish potato. The potato thrives best in a temperate climate. The potato crop of 1900 for our nation was, in round numbers, 211 million bushels. The fifteen States producing the greatest number of bushels are here named, with the yield in thousand bushels:

1.	New York	27,481
2.	Michigan	16,631
3.	Wisconsin	15,620
4.	Illinois	15,296
5.	Iowa	14,004
6.	Ohio	12,561
7.	Pennsylvania	10,921
8.	Missouri	10,107
9.	Nebraska	9,664
10.	Indiana	9,060
11.	Minnesota	8,636
12.	Kansas	7,246
13.	Maine	6,200
14.	Vermont	3,305
15.	West Virginia	3,029

The nation's potato crop for 1900 was valued at ninety millions of dollars.

The potato belongs to the same botanical family that tobacco, capsicum, the egg-plant and the tomato do.

The *Sweet Potato* is not a potato, but is a tuber of the morning-glory family. It was one of the presents that Columbus brought Queen Isabella from the New World. It has been thought that this was the potato spoken of by Shakespeare and other early English writers, rather than the Irish potato. The Chinese are reported to have cultivated the sweet potato from very early times; hence this plant may be a native of the Orient as well as the Occident. The sweet potato thrives best in a subtropical or tropical climate, although it is a profitable crop now in States as far north as Michigan and New Jersey. The South-Atlantic and Gulf States, with New Jersey and Virginia, furnish the greater part of the sweet potatoes of domestic commerce.

The *Yam* is a tropical plant related to the sweet potato, and is cultivated in southern temperate climes as a food product, the same as the sweet potato.

The *Manioc* plant is a woody-stemmed plant with parsnip-like roots, indigenous to tropical America. The starch from the roots is the Brazilian arrow-root. The ground-up root is cassava. This is by the natives mixed with water and baked in thin cakes as cassava bread. By moistening the starch obtained from the roots of this plant, granulating it and heating on metal plates, the tapioca of our mother's pantry is obtained. The root

Carrying Bananas to Market, Jamaica, W. I.

from which tapioca comes is poisonous, as it contains prussic acid, but this is either squeezed out with the water of the tuber or evaporated when cassava and tapioca are made; so both food elements are absolutely free of the poison.

The Fruit Family.

1. *Figs.* This is probably the earliest known fruit; is a native of Asia, and is counted one of the most valuable of fruits, being used both as a food and for medicinal purposes. It is now cultivated throughout southern Europe and in parts of our own nation. The best figs come from Smyrna, but the Agricultural Department of our nation has found a certain Asiatic insect that fertilizes the fig blossom, and is now seeking to grow Smyrna figs in the arid lands of southern Arizona, with fair prospects of success. This will truly "make the desert blossom," and mean millions of dollars to the nation.

2. *Grapes.* This is also a fruit known to the ancients, found by Joshua when he went to "spy out" the promised land. The grapevine grows best in temperate regions, and is extensively cultivated for its berry fruit. A small seedless grape, raised in Greece and its adjacent islands, is dried, and forms the currants of commerce. (Believed to have been so named from Corinth, Greece.) This one article constitutes 50 per cent. of the exports of Greece. Raisins are dried grapes, produced in large quantities in the Grecian Archipelago, Asia Minor, southeastern Spain, and California. From grapes wine is manufactured. The principal wine-producing regions are France, Germany, Hungary, Spain, Portugal, Madeira, and California. California is the wine State of our nation, producing upward of fifty million gallons yearly. One of the finest grape regions is in the vicinity of Lakes Erie and Ontario, in northern Ohio and western New York.

3. *Bananas.* The banana is a tropical plant largely cultivated in all warm climes. It grows to be fifteen to twenty-five feet high, but each year dies to the root. Its fruit is very nutritious, and is a main source of food in tropical regions. A fiber from the banana-skin makes a beautiful cloth.

4. *Apples.* The apple is believed to be a native of Asia, having been brought to Europe by the Romans. The crab-apple is indigenous to Great Britain. The apple was the first American fruit exported. Aside from apples, fresh and dried, and vinegar, one of the chief apple products, no other fruit item is recorded among our nation's exports prior to 1865. In 1821 our exports included 68,000 bushels of apples, while now the yearly exports of this fruit average: apples, one million barrels; dried apples, thirty million pounds; cider, 625,000 gallons; and vinegar, 100,000 gallons. The nation's annual apple crop more than fills sixty million barrels. Since the invention of the fruit evaporator (1870–75), the export trade in dried

Picking Oranges, Riverside, California, U. S. A.

apples has risen from $250,000 to one and one-fourth millions of dollars, and is still increasing. Judge Wellhouse, of Kansas, has the largest apple orchards in the world. His orchards cover 1630 acres, and number upward of 100,000 well-selected trees. The apple does not thrive in a warm climate. Limestone soils with good drainage, in temperate regions, seem best adapted for this fruit. Cold storage and quick transportation service have greatly stimulated the shipping of all fruits, and one-third of the fruit exports of our nation are apples, either dried or fresh. The United States and Canada are the greatest apple-raising regions, and Great Britain, France and Germany are their best customers.

5. *Oranges.* This fruit has been cultivated in India for many centuries. It was brought to Europe by the Moors. In the New World, Florida, Louisiana, Mexico and California furnish the orange of commerce. The trees are prolific bloomers, and the blossom is most beautiful and very fragrant. Each year 1600 tons of orange blossoms are used for perfumery purposes. A single orange tree has been known to yield 20,000 oranges, and a single acre of trees will produce ten tons of fruit. The trees will bear fruit for more than 100 years. The seedless or navel orange was introduced into the United States from Bahia, Brazil, in 1870, by Mr. William Saunders, superintendent of the gardens and grounds of the U. S. Department of Agriculture. He had twelve trees of this unique variety of oranges shipped him from the Bahia district. From these trees Mr. Saunders obtained buds, which were grafted upon small orange plants and shipped to Florida and California. The new orange did not thrive in Florida, and, while it thrived in California, it awakened little interest until two trees came into bearing in 1879, at Riverside, California. The first crop from these two trees consisted of sixteen oranges. Now, Riverside annually sends out to the world 1,600,000 boxes of navel oranges. While California and the Gulf States have prolific orange groves, that during the fruit season send solid trains of orange cars across the continent to our great fruit-distributing centers, yet at present we are importing two million boxes to supply the home demand. Some come from the islands of the Mediterranean sea—chiefly from Sicily and Malta, Portugal, Azores, Mexico, and West Indies. Oranges are packed for shipment in oblong boxes, each orange being wrapped in tissue-paper and in a division compartment to prevent bruising or rubbing. The orange belongs to the botanical family of citrus fruits.

8. The *Lemon* is a member of this same evergreen group of citrus fruits. The lemon tree is not as symmetrical as the orange tree, is not as hardy, and averages twelve feet in height. The lemon was used by the ancient Roman to keep moths from his garments, and in Pliny's time the

fruit was deemed an excellent poison. While the tree is more tender than the orange tree, its fruit will keep better. A lemon tree yields from 3000 to 8000 lemons in one season. The extract and oil of lemon are important articles of commerce, as well as the fruit from which they are obtained. California and Florida are the principal sources of our lemons, although they cannot supply the home demand. From two to three million boxes of lemons are yearly imported. These are obtained from the Mediterranean lands, West Indies, Mexico, East Indies, and Carribean states of South America.

9. The *Lime* is a citrus fruit, closely related to the lemon. The juice is much used for "summer drinks" and for medicinal purposes. Lime-juice prevents scurvy, and therefore has a place in the medicine-chest of every navy in the world. Confectioners and cooks make important uses of lime-juice.

10. The *Orchard Fruits*, pears, peaches, cherries, apricots, nectarines, are important articles of domestic trade, but do not enter largely into the international or world commerce, being quite perishable fruits.

11. The *Berry* or *Small Fruits* are strawberry, raspberry, blackberry, huckleberry, cranberry, gooseberry, and dewberry. The strawberry is the most important small fruit grown. It grows wild in many parts of the United States and Europe, but has been greatly improved by cultivation. It is considered one of the most desirable of fruits. Something like a million cases a year are taken to our large cities on "strawberry trains." In some parts of Mexico strawberries can be so grown as to ripen every month in the year. In the United States the strawberry harvest begins in early spring at the Gulf, and goes slowly northward, the Canada strawberries maturing in July.

The berry business has created the demand for berry-boxes and baskets. Basket factories have been built near the fruit regions of Michigan, California, Illinois, Maryland, New York, New Jersey, and Georgia. The fruit business has opened up large canning and preserving factories, and these in turn have increased the capacity of tin-plate mills and glass factories to supply the needed tin and glass for canneries.

One of the most important garden fruits canned is the tomato. This is a garden vegetable common to all North-American gardens. Linnæus gave the tomato a Persian name (*Lycopersicum esculentum*), but eminent English botanists credit this plant to South America. Less than 100 years ago the tomato was believed to be poisonous. While the skin is indigestible, we use the luscious pulp raw, cooked, or canned, at all seasons of the year.

Corn, beans, peaches, apples, cherries, pears, plums, the berries, and tomatoes, are canned and sent far and near. American canned goods are in demand in international trade from Russia to Australia.

12. The *Pineapple* is a most remarkable fruit, indigenous to the tropics. A cone-shaped growth weighing from two to six pounds is formed close to the ground. This is topped with flowery plumes, and is surrounded with cactus-like leaves. This cone contains a woody pulp in which is secreted a most palatable juice. This fruit is now quite successfully grown in Florida and California, and is being introduced into all the Gulf States. Our chief supply of pineapples has formerly come from Mexico, Central America, and the West Indies.

13. The *Olive*. The olive tree is a native of Asia Minor, and is noted for its fruit, its oil, and its long life. It is an evergreen that flourishes best in subtropical climes. The fruit, pickled before it ripens, is a very important article of commerce, from Italy, France, Spain, and Turkey. From the ripe fruit is obtained the olive-oil of commerce. In Spain and Italy this oil is used by many peasants as a substitute for butter. The olive was brought to America by the Spaniards, about 200 years ago. It is cultivated in many

parts of Mexico, southern California, especially in the region of San Diego, and in the South Atlantic States as far north as North Carolina. Olive-wood is fine grained, and is much used for cabinet work. The tree rarely exceeds twenty feet in height, and is the earliest tree of antiquity. Its branch from remote times has been the emblem of peace and plenty.

Where the Luscious Pineapple Grows, Florida, U. S. A.

Miscellaneous Garden Products.

Aside from the vegetables and fruits already mentioned, melons, pumpkins, squashes, cucumbers, cabbages, cauliflower, spinach, chard, celery and asparagus deserve a place on our commercial list.

The greatest melon center east of the Mississippi is Atlanta, Georgia, and the greatest one west of the Mississippi is Rocky Ford, Colorado. Trains of melons are distributed by the railroads many hundreds of miles from these centers each season. The melon is a native of Asia. Columbus is believed to have brought it to America. The finest melons in Europe are raised along the Volga river.

The pumpkin is raised in nearly all parts of our nation, and its pies are always appetizing.

Squashes are related to pumpkins on the one hand and to gourds on the other. The crookneck, scallop and Hubbard all furnish table delicacies.

The cucumber belongs to the melon tribe, and both melons and cucumbers are members of the gourd family, and are the leading edible fruits in this large group of plants. The cucumber is largely used for pickles, and its commercial importance arises from this fact. The largest pickle factories in our nation are at Pittsburg, Pennsylvania. Here, five billion cucumbers are bottled yearly. These factories establish salting-houses in the cucumber districts of western Pennsylvania. Gardeners bring their cucumbers to these salting-houses. Here they are placed in large cylindrical vats and covered with brine. When taken to the factory these salted pickles are cleaned in warm running water, which preserves their green color. They are placed in the sorting-machine and separated into different sized groups of pickles. A row of girls now receive the pickles, and, with a pair of slim wooden tongs, arrange them in good form in bottles. Vinegar and spices are then added. The bottles are corked, labeled, covered with tin-foil, and cased for the market. One pickling manufactory at Pittsburg covers ten city blocks, and, working up cucumbers, onions, cauliflower, beans, beets, tomatoes and other vegetables, manufactures fifty-seven different food products. This factory was established in 1869, and some one or more of its food products can be found at every cross-roads grocery in the nation.

Of the rest of these vegetables, celery is the most important. It is much used in many patent medicines and drugs, and its succulent stalks grace the dinner-table all the year round. Kalamazoo bottoms in Michigan have just the right climate and the proper soil and moisture for this plant.

For this reason, the city of Kalamazoo is the celery center of our nation, and three crops per year are sometimes raised there. While the leaves may be bleached by being covered for a fortnight, yet much of the celery is bleached by sulphur fumigation. The yearly output of celery in the Kalamazoo district averages from 900 to 1000 million bunches.

The Spice Family.

Spices are those vegetable substances that are much used for flavoring foods.

1. *Ginger.* Ginger is cultivated in the East Indies, the West Indies, and in China. It is obtained from the roots of the plant. The root-stalk of young plants is frequently preserved in syrup.

2. *Pepper.* The berries of the pepper plant form an important article of spice commerce. The plant is a climbing shrub much cultivated in tropical countries, especially in the East Indies. The berries grow in clusters, and are of a bright red color. The berry when ripe is soaked in water until the red skin falls off. This gives the white pepper of commerce. The black pepper comes from the pepper-berries that are picked before they ripen, and turn black. In mediæval times this was the most costly of the spices. Eighty per cent. of our nation's pepper that is imported comes from the British East Indies.

3. *Cinnamon.* Cinnamon is the bark of an evergreen tree that is native to Ceylon. The trees are from twenty to thirty feet high, are long lived, and the bark from young shoots as well as trees 100 years old is utilized in the cinnamon trade. The trees are stripped twice a year. The bark is scraped until quite thin, and laid out in the tropical sun to dry. When perfectly dry these strips are tied into bundles and sent to market. The world's cinnamon port is Colombo. Cinnamon trees are also grown in China and the northeastern coast of South America.

4. *Cloves.* The cloves of commerce are the fruit-buds of a tropical tree. These buds are picked just before they are ready to open, and are dried in the sun. The tree grows to the height of thirty to forty feet, lives to be 150 to 200 years old, and is a native of the Molucca Islands. The principal clove supply of the world to-day comes from the islands of Zanzibar and Pemba. A valuable oil is also obtained from cloves.

5. *Nutmeg.* The nutmeg tree looks much like a pear tree; is from twenty to thirty feet in height, and is found in the tropical regions of Asia, America, and the island of Madagascar. The fruit when ripe is blood-red. It is inclosed in a husk that breaks open when the fruit matures. The fruit is obtained by means of a barb fastened to a long stick. The fibrous pulp of the fruit is the mace of commerce. The kernel or seed of the fruit contains the nutmeg. The pulp is dried until it is of a golden-brown color, and is preserved by being sprinkled with sea-water. The seeds are dried over a slow fire not exceeding 140° temperature. This is kept up until the nut within the kernel shell rattles freely. Often this takes two months' time. Now the shell is cracked and the nut is obtained. This is the nutmeg of commerce.

6. *Allspice.* The allspice of commerce is the berry of the bayberry or pimento tree. This tree is a native of the West Indies and South America. In Jamaica it grows wild in great abundance, and is a highly ornamental tree. It averages from twenty-five to thirty feet in height. One tree has been known to yield 150 pounds of fruit. The berries are picked just before they ripen, and are very carefully dried. They then retain their aromatic flavor, which is supposed to combine the flavor of cinnamon, cloves, and nutmeg,—hence the name, allspice. If allowed to ripen, the berry loses this flavor.

7. *Cayenne Pepper.* Cayenne pepper is the pod of a South-American plant, first brought from Cayenne, Guiana. This plant is called capsicum; has four species, only two of which are valuable to commerce. Capsicum is a native of tropical re-

gions, but is grown in nearly all parts of the commercial world. It grows from two to three feet high; has an ovate or a conical pod, which is often picked green and used for pickling. When ripe the pod is a bright scarlet or orange color. The ripe pod is picked, dried, and ground to powder. This is the cayenne pepper of commerce, quite largely used as a condiment to aid digestion. A volatile liquid is extracted from the Guiana pepper that is much used in place of the powder in medicine.

8. *Mustard.* Mustard is an annual plant, well known and much used in ancient times. The seed is an important article of spice commerce. There are three important varieties: black mustard, found principally in Europe; white mustard, found in Europe, Asia, and the United States; and a wild mustard, found in England and North America.

Coffee Trees in Blossom, Blue Mountains, Jamaica, W. I.

Beverage Family.

1. *Coffee.* The coffee tree is an evergreen tree, in its wild state reaching a height of twenty to thirty feet. The cultivated tree is prevented from attaining a height of more than twelve feet. The coffee tree is a native of Abyssinia, and is believed to have taken its name from Kaffa, a province in Abyssinia. Coffee has been an article of commerce for a thousand years. The *Coffea arabica,* as it is known to science, is a shrub from four to eight feet high. This shrub furnishes the Arabian coffee. Coffee leaves are dark green in color, and the blossoms are pure white, and very fragrant. The fruit grows in clusters, from three to twelve berries in each. The fruit when ripe is very much like the cranberry in color, shape, and size. This fruit has a yellowish pulp, that is pleasant to the taste. It contains two irregular half-sphere-shaped seeds, although sometimes there is only one seed, almost round. Very many seeds in the Arabian or Mocha coffee are single or "male" seeds. The berry pulp is removed by passing through wooden rollers, and the seeds or beans are dried, roasted, polished and sacked as the coffee of commerce.

The coffee plant grows anywhere beyond the reach of frost, and in climates not affected by excessive drouth or moisture. It thrives best on steep mountain-sides about 1000 feet above sea-level, and upon well-drained plains. As the plants bear fruit many months, several crops are gathered each year. A tree bears fruit after three years old, and a plantation lasts from twenty to twenty-five years. A yield from one to six pounds of coffee seeds or beans is obtained from each tree at each period of fruiting. The coffee trees of Brazil yield from three to six pounds per tree. It is said that one farmer can care for an orchard of 2000 to 10,000 trees. At the time of bearing the trees have cost the farmer from thirty to sixty cents apiece.

In Arabia the leaves of the coffee plant are dried, rolled, and used as tea leaves. This coffee made from the leaves has the flavor of the beans. Brazil now furnishes commerce over sixty per

cent. of its coffee. Rio Janeiro is the greatest coffee mart in the world.

2. *Tea.* The tea plant is an evergreen shrub, cultivated for its leaves. In its native or wild state it grows from fifteen to thirty feet high, but under cultivation its height is kept below ten feet. This plant is believed to have been first cultivated in China. It was first brought to Europe by the Portuguese, in the sixteenth century. The tea farms of China are usually small, and are in North China. The leaves can only be gathered at certain seasons, and the plants require much care. When, in the spring, the new leaves burst from the bud, they are gathered while young and tender. This tea loses much of its flavor when transported long distances, and is therefore principally used for domestic trade and the Russian caravan trade. It brings a very high price in Russia. Just after the summer rains, a second picking gives the principal tea of commerce. A third picking in midsummer furnishes a poorer tea, used by the lower classes.

Tea leaves are dried by the air and sun, and are roasted in shallow pans over a slow fire. It is now hand-rolled, assorted, and packed in chests lined with lead sheets to keep out the air. This process is carried on not only in China, but in Japan, East Indies, Brazil, and all other tea-producing countries the method of preparing tea for trade is practically the same. The plants are raised from the seed, and the tea farm is restocked with new plants when the old shrubs are ten to twelve years old.

Tea farms are being successfully developed in South Carolina and Georgia on our Atlantic coast, and in southern California on the Pacific coast. Tea can be profitably raised in Mexico, Central America, and the northern half of South America. The price of labor in the tea-growing region is an important factor in its culture, as the plant requires much care and attention.

3. *Pulque.* This is the national beverage of Mexico. It is made from the "honey-water" or juice of the maguey plant. This plant is a species of the agave or century-plant group. The plant requires from seven to eight years to mature in Mexico and Central America, where it is native. It takes from fifty to sixty years for the plant to mature and blossom in greenhouses in this country, and as it dies after it has blossomed and requires so many years to mature out of its native climate, we call the agave the century plant. When the plant matures it sends up a flower-stalk from twenty to thirty feet high. This ends in clusters of blossoms, often numbering between 3000 and 4000 flowers. In Mexico, when the maguey plant flower-stalk begins to appear the Mexican cuts the center of the stem out. Often this leaves a hollow eighteen inches across and fully as deep. The honey-water that the plant has stored for the flowers, flows into this hollow. It is collected, fermented, and becomes pulque, the great Mexican drink. The honey-water is quite sweet, but the pulque is sour, has the consistency and appearance of thin buttermilk, and a disagreeable odor. Mexicans regard it as agreeable and delightfully refreshing. A maguey plant at the flowering stage yields from ten to twelve pints daily for a period of twelve to sixteen weeks. Mexicans are so fond of this drink that their capital city alone uses thousands of barrels of pulque daily. From the plant's leaves is obtained a fiber used to manufacture cloth, twine, rope, and paper. The dried leaves are often used in place of shingles on houses. Along the edges of the leaves are thorn-like needles. These are connected with fine fibers, which, by twisting together, make a strong thread. Some people therefore call this the thread-and-needle plant. The roots are cooked and used as food, while the whole plant makes a good fuel. This is therefore a very useful plant.

4. *Chocolate.* Chocolate is the Mexican name for the cacao tree. This tree resembles the cherry tree in form, and grows from twelve to twenty-five

feet high. The fruit is a sort of cucumber, of a yellowish red color, and the pulp is used for food. Within the pulp are from twenty to thirty seeds, or beans. These beans contain two lobes called "nibs." From these, cocoa and chocolate are obtained. The tree is an evergreen, and carries both flower and fruit in all stages at the same time. The fruit ripens in July and December. One tree seldom yields more than a pound and a half of beans. These beans are roasted with great care. The greatest chocolate mills are in Holland. In these mills a cracker and fanner breaks off the shell and lets the nibs fall out. These nibs are then ground and made into a thick chocolate paste. This is now molded into cakes, wrapped in tin-foil, and sent to market. The cacao bean or nut is more than 50 per cent fat. This, when extracted, constitutes cocoa butter, much used by confectioners and in the finest grades of toilet soaps. The residue remaining after the butter or oil is pressed out of the chocolate paste constitutes the cocoa or cocoa-shells of commerce. The cacao tree grows best in Venezuela, although the tree is now found in nearly all tropical countries. It is believed to be a native of tropical America. Our nation consumes fifty million pounds of chocolate and ten million pounds of cocoa yearly.

5. *Yerba Maté.* This is a species of holly that grows in the river valleys of Paraguay and in the valleys and table-lands of southwestern Brazil. The leaves are gathered and carefully dried after the manner of tea-leaves in other countries. The aborigines were using these leaves when the Europeans came, and called the drink maté. Maté is used as a beverage quite generally over South America. It is estimated that no portion of the world consumes so large an amount of tea in proportion to its inhabitants as is used of the maté by the South-American people.

The Fiber Family.

This is a very large group, numbering 1018 different plants, that furnish some species of fiber used in the manufacturing world. Those fiber plants that furnish an important element in our nation's commerce are named below.

1. *Flax.* Flax rivals the staple food plants in its importance to mankind. The Swiss lake-dwellers, who lived when the long-extinct mammoth was earth's elephant, wore fabrics made of flax. Egypt was noted for the fineness of her linen 3000 years ago. Here flax was first known. This useful plant was brought to our land in 1626. The fiber was made into sail-cloth in Massachusetts in 1790. From its thread Ireland manufactures a fine variety of linen called damask. Belgium and Holland from linen thread make the finest of laces and fancy edgings. The first mill for spinning linen yarn in Great Britain was built in 1787. In 1834 a large mill was built at Fall River, Massachusetts. The countries leading in the manufacture of linen are Great Britain, Belgium, and France. A light linen fabric called lawn was first made in France, but is now made in many other countries. From flax-seed is obtained linseed oil, much used in the manufacture of paints and varnishes. The meal of the seed left after extracting the oil is a commercial stock food known as oilcake.

2. *Cotton.* There are many different species of this plant native to the tropical regions of Africa, Asia, and America. Cotton was the original fiber of India. The Phœnicians and Babylonians were noted for their skill in making textile fabrics of cotton as well as linen, while cotton fabrics were used in both Greece and Rome. Columbus found cotton growing in America, and in Peru mummies of a prehistoric age have been found wrapped in cotton. The finer muslins and laces are made from the Sea-Island cotton grown on the islands and seacoast of South Carolina, Georgia, and Florida, and the Egyptian cotton. Sea-Island cotton was first brought to the United States in 1786.

From the common Brazilian and American cotton, cambrics, calico and shirting are made. Fus-

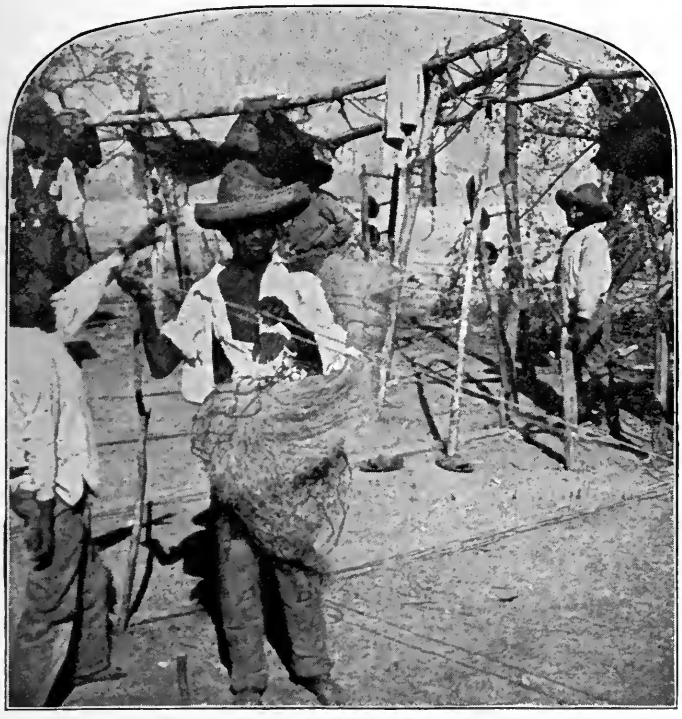
Picking Cotton, Georgia, U. S. A.

tian is made from the poorer qualities of Surat and American cotton.

The most perfect system of cotton cultivation is found in our own nation, which, from 1890 to 1900, furnished 62½ per cent. of the world's cotton. It now furnishes over 66 per cent., or two-thirds of the cotton of the world. The most of the world's cotton is raised between the 35th and 40th parallels north latitude. The principal cotton-producers outside of the United States are India, China, and Egypt. These three countries furnish 30 per cent. of the world's cotton. Greece, Italy, Turkey in Asia, Persia, Mexico and the West Indies furnish the remaining amount of cotton that makes up a world's yearly output of fifteen million bales of 500 pounds each.

Up to 1793, the "churks" had been used for centuries in Oriental countries as a hand-mill for separating the seeds from cotton fiber. In this country slave labor was employed on the plantation, and all cotton was "seeded" by hand. From one to five pounds constituted a day's work for a man. In 1793 a New England school teacher, visiting in the South contrived a machine that worked admirably from the start. This machine was a cotton-gin that could clean a thousand pounds of cotton in a day. It was invented by Eli Whitney, in 1793. This machine reduced the labor and expense of "seeding" cotton, increased the acreage of cotton, and caused Robert Fulton to say, "Arkwright, Watt and Whitney have done more for mankind than any of their contemporaries." Sir Richard Arkwright invented the cotton-spinning frame in 1768, that enables one man to do the work of thirty. The spinning-frame and cotton-gin greatly increased the importance of cotton as a commercial fiber. The first cotton-mill in the United States was built at Pawtucket, Rhode Island, in December, 1790, by Samuel Slater. The water-power of New England was utilized in making cotton goods, and Lowell, Manchester, Lawrence and Fall River became centers where millions of yards of cotton cloth were manufactured.

In 1793 Samuel Slater set seventy-two spindles to spinning cotton. In 1900 we had 18,500,000 spindles making cotton yarn in this country. The past decade has seen a large number of cotton mills established in the South. Nearness to the cotton-fields, abundance of fuel and cheapness of labor are factors that have led to the establishment of



Native making Rope from the Fiber of the Maguey Plant, Monterey, Mexico.

these mills. In 1899 these mills turned 1,415,000 bales of cotton into yarn and cloth; while the Northern mills used only 2,217,000 bales of cotton. South Carolina leads the Southern States in cotton manufactures.

In 1899 the United States passed Great Britain in the amount of cotton manufactured.

In 1899 the greatest purchasers of American cotton were as follows (in thousand bales, of 500 pounds each):

1. Great Britain	3,610	9. Russia	94
2. Germany	1,728	10. Austria	56
3. France	804	11. Netherlands	52
4. Italy	400	12. Denmark	39
5. Spain	248	13. Mexico	36
6. Japan	182	14. Sweden and Norway	24
7. Belgium	130	15. Portugal	22
8. Canada	98		

The great cotton ports of our nation rank as follows:

1. Galveston ships 29 per cent. of export cotton.
2. New Orleans ships 25 per cent.
3. New York ships 8 per cent.
4. Savannah ships 8 per cent.
5. Boston ships 6 per cent.

The greatest cotton mart in the world to-day is Galveston, Texas.

It has been found that the pulp made from stems of the cotton plant can be successfully used in the manufacture of writing-paper. The oil from cotton-seed is much used for domestic purposes as "cottolene." The residue left after extracting the oil is a valuable stock food, and is sold as oilcake. Cotton-seed flour has been found not only palatable but highly nutritious, and bids fair to enter commerce as a food element.

3. *Hemp.* This is an annual plant, that grows in both hot and cold countries. It is valued for its fiber, which is used in making cloth, twine and ropes; and its seed, which is food for cage birds, yields an oil used in some lands for illuminating purposes, and in making paints, varnishes and soaps. From the seed an intoxicating beverage is obtained called hashish. This is much used in Arabia and Oriental lands.

The principal hemp-producing States of our nation are Kentucky, Tennessee, Virginia, and Missouri. We import hemp from Russia, France, Germany, and Austria.

From a species of plantain, closely resembling the banana tree, and growing from eighteen to twenty-five feet high, is obtained a light-colored fiber. As most of it is shipped out from Manila, P. I., it is called manila hemp. It constitutes the most important article of export of this commercial port. The finer fiber is woven into cloth and sandal straps; the rest is made into coarse cloth, binding-twine, and ropes. The natives of the Philippines have crude instruments for preparing the fiber for market, and waste nearly half of it; yet their average crop approximates 800,000 bales of 250 pounds each. England and the United States purchase nearly the entire crop.

The fiber obtained from dogbane, a small perennial plant, was used by the Indians, and is commercially known as Canada hemp.

4. *Sisal,* a fiber similar to hemp, is much used in rope-making, and is imported from Mexico and Yucatan.

5. Vegetable hair from Spanish moss, and palmetto fiber, are much used in parts of our nation. Fiber manufacturers import ramie from China, jute from India, raffia from Africa, tampico from Mexico, cocoanut fiber from East Indies, and the fiber of the maguey plant from Mexico. In Germany a cloth is made of the needles of the pine, in Sweden a very durable cloth is made from the fiber of the hop plant, and in the islands of the south tropical oceans the bast of the paper mulberry is largely used in paper-making. In Japan the fiber of the paper mulberry is used for handkerchiefs, napkins, and many other domestic fabrics.

The Medicine Family.

1. *Cinchona Tree.* (Previously discussed.)

2. *The Poppy.* Opium is derived from the milky juice of the white poppy. This plant is cultivated in India, Persia, China, Turkey, and Egypt. The most important opium district in the world is along the Ganges river, India. This is one of the most powerful narcotics and is an important element in compounding medicines.

3. *Nightshade.* This is the name of a family of plants, widely diffused over the earth. The potato and the tomato, which belong to this family of plants, have been discussed as food products. The next most important member of the nightshade group of plants is tobacco.

Tobacco is a native of America. A Frenchman, Jean Nicot, first brought the seeds to Europe, and the plant was named Nicotiana, in honor of him. The plant was first discovered by the Spaniards, in St. Domingo, near the close of the fifteenth century. There are many species of the plant grown for use in smoking, chewing and snuffing, as well as for its medicinal use as a narcotic.

The constant use of the leaf of this plant causes suffering, and tobacco is now taxed as a luxury by nearly all commercial nations. Our own nation obtained from its revenue tax on tobacco, in 1900, 73½ million dollars. The yearly crop in the United States amounts to 500 million pounds annually. Virginia is our best tobacco-growing State, although it is raised in all the Southern States. Special kinds of tobacco are grown in the West Indies, Persia, Paraguay, China, and the United States.

Other important members of the nightshade family furnish from either their leaves, seeds or roots, belladonna, gelsemium, nux vomica, strychnine, and other powerful medicinal substances. Some of the most virulent herb poisons known are obtained from the nightshade plants.

4. *Aromatic.* (*a*) Caraway, (*b*) Coriander, (*c*) Anise-seed. The seeds are much used in seasoning foods, and have also medicinal value.

5. *The Cactus Group.* This consists of 1000 species, native of tropical America. The more important members are the night-blooming cereus, the cereus, prickly pear, veiled pear, and opuntia. The opuntia coccinellifera secretes the cochineal insect, so valuable in dyeing fabrics.

6. *Myrtle Group.* This group numbers 1800 species, varying in size from a small shrub to a good-sized tree. The guavas, pimento, blue gum, eucalyptus, Brazil nut, as well as the common myrtle, belong to this group.

7. The *Soapberry Group* consists of shrubs and trees, and numbers between 600 and 700 species. To this group belong the maples, box-elder, buckeye, bladder nut, and horse chestnut. The soapberry tree proper is a native of tropical America. The rind of the hard globose seeds of this tree is saponaceous, and is much used for soap. The hard maple is well known in the Northeastern States of our nation. Its sugar is a valuable commercial product of Vermont, New York, and Ohio.

8. The *Rue Group* numbers 650 species of shrubs and trees. To this group belong all the citrus fruits,—oranges, lemons, citrons, limes, etc.,—as well as the prickly ash and rue trees. The last-named trees are cultivated solely for their medicinal qualities.

9. The *Geranium Group* numbers 750 species native to tropical regions, as the balsam, of India; oxalis, of Africa; and tuberosum tropœolum, of Peru.

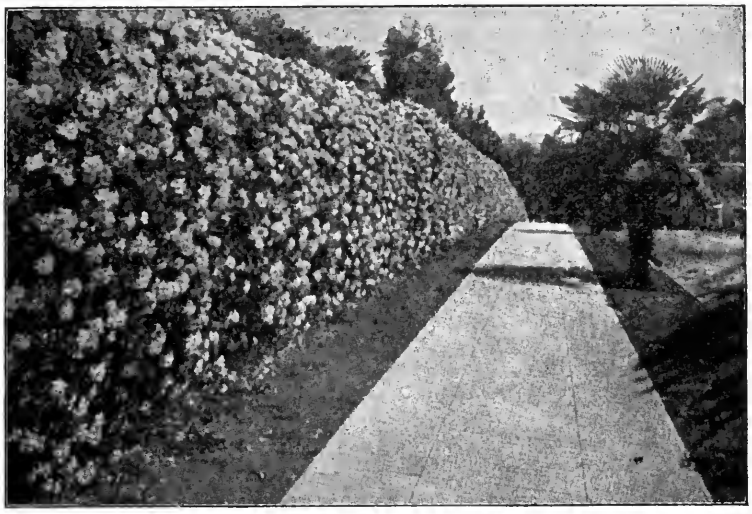
10. The *Saxifrage Group* consists of herbs, shrubs and trees of temperate and cold climates.

11. The *Mallow Group* consists of 700 species of herbs, shrubs and trees. The silk tree, baobab, mallows, and hollyhock are representatives of the general distribution as well as botanical characteristics.

12. The *Cruciferæ* or *Mustard Group* numbers 1200 species. This group is a native of the Arctic regions, and its plants are much cultivated over the north-temperate regions. Most of the members of this group furnish edible leaves or roots, while others, like the mustard, have also valuable medicinal qualities.

13. *Smilax Group.* This group numbers many species. The sarsaparillas of the drug market come largely from the Mexican, Central-American and South-American plants of this group.

14. Juniper berries, peppermint leaves, ipeca, belladonna root, castor beans, digitalis, ergo, liverwort, pawpaw juice and marshmallow roots furnish well-known and valuable members of a miscellaneous list of a crude-drug trade that classifies hundreds of medicinal plants that cannot be mentioned in a work of this kind. The crude-drug trade of the United States amounts to millions of dollars annually. New York, Detroit, San Francisco and St. Louis are great distributing points for this trade. One of the largest local markets for barks and herbs is Asheville, North Carolina.



A Geranium Wall—California.

Miscellaneous.

There are 420 species of plants used for perfumery purposes. Grasse, France, is a very important center of the perfume industry. This one center uses annually 1,200,000 kilogrammes of roses, 1,000,000 kilogrammes of jessamines, 2,000,000 kilogrammes of violets and orange blossoms, besides the tuberoses, mignonette and cassias used. These are gathered, oils extracted from the flower petals with lard, and the resulting "pomade" is sent to all parts of Europe and America. Here grasses and other ingredients are added and the perfume of commerce appears.

The cut-flower markets of Europe and America are creating an important demand for cut flowers in commercial quantities. New York city is the greatest flower market in the world, using six million dollars' worth of flowers annually; while flower shows are approaching the importance of expositions in large commercial centers. A rose farm near Madison, N. J., and an orchid farm near New Rochelle, N. Y., have stock worth more than a million dollars each, and illustrate a new and greatly expanding industry. The cut-flower trade of the United States, for 1900, amounted to more than twelve million dollars.

FURS OF COMMERCE.

Furs were among the first materials used for clothing. The barbarians of Europe used furs to clothe them, and when they became civilized, they used fur-covered couches and made "art squares" for their tents of furs. When the quantity of furs at home was lessened the fur-loving Europeans sought other lands, where trading-posts were established and a lucrative trade opened in breadstuffs, building material and fuel, as well as furs. In this way many parts of Russia and Siberia in the Eastern continent, and Canada, Alaska and our own Northwest have been opened up to civilization. After the trading-post came forts, to protect the traders, while hamlets of traffic sprang up along the routes of trade. One of the oldest fur companies of America was the Hudson Bay Company, established by Prince Rupert in 1670. The Northwest Fur Company was formed in 1783, but this joined the Hudson Bay Company in 1821. The furs collected by this British company are sold at half-yearly sales in London. The headquarters of the Hudson Bay Company, where furs are baled, is at Winnipeg.

In the very year the American colonies gained a treaty from their mother country granting freedom and acknowledging their independence, the founder of the American Fur Company, John Jacob Astor, came to our shores. Mr. Astor founded a fur trading-post on the left bank of the Columbia river in the Northwest, in 1811. This soon became one of the fur centers of the trade, and was named Astoria. This trading-post developed into an important commercial center, and greatly strengthened the claim of the United States to the Oregon country.

In the year 1840 some Canadian fur-traders built a number of log huts on the present site of St. Paul. In 1849 St. Paul was a village of 500 people and the capital of the newly formed Territory of Minnesota. To-day the greatest fur center of our nation is St. Paul, where millions of costly pelts are collected from the great Northwest and made into such garments as the fashionable woman, the Northern farmer, the hunter, the cowboy, the street-car motorman or the roadster demand. The season's product of the St. Paul fur-dressers is approximately as follows: Raccoons, 115,000; Australian wombats, 85,000; Russian, German and American calfskins, 120,000; otter, 10,000; beaver, 7,000; mink, 16,000; opossum, from Australia 10,000, from America 5,000; wolf, 4,000; muskrat, 45,000; Chinese dogs, 75,000; foxes, 1,500; Galloway cattle, 3,500; marmots, 65,000; sables, 600; with a few seals and miscellaneous furs.

The most expensive and highly prized fur is the Russian sable. The ermine, a small animal, a member of the mink family, found in northern Europe, Asia, and America, formerly furnished the fur that lined the robes of kings and queens. One king of France used over 700 ermine skins to line his robe. The fur in summer is a tint of brown in color, but in winter is snow-white, with the exception of the tail, which is black. This is used to ornament robes and muffs. The best ermine furs come from Hudson bay, Siberia, and Lapland.

The seal fur is probably the most generally used fur. This fur, soaked in water and frozen, makes the best shoe the Esquimau can use for his sledge; while its use in caps, capes and cloaks is common in all northern countries. The greatest region for the sealing industry is in the vicinity of the Pribylof Islands, Alaska. The United States purchased Alaska of Russia in 1869, and in 1870 the Alaska Commercial Company leased the right to take 100,000 seals per year, agreeing to pay $50,000 rent per year and a tax of $2 per sealskin. British Co-

lumbian and Alaskan sealers have carried on pelagic sealing (killing female seals on the way to their breeding-grounds) with such wanton destruction, that the United States and Great Britain have prohibited pelagic sealing, as it threatens the extinction of the seal.

The otter possesses a glossy brown fur that is so highly prized that the American species is well-nigh exterminated.

The beaver is at home in North America. Its fur is much used in muffs, capes, and hats.

The Novgorod fair is the annual fur market of Russia. The semi-yearly fur shows of Leipsic permit Russia, Germany, Austria, Turkey and other central European nations to exchange pelts and fur manufactures. The greatest fur market in the commercial world is London. Most of the Canadian, Australian, and a large majority of the seal furs of the world are sent to the London fur manufacturers.

The most important furs used in the St. Paul manufactures are:

1. Hair and wool seal — North Atlantic and Pacific oceans.
2. Sea otter — North Pacific ocean.
3. Wombat — Australia.
4. Kangaroo — Australia.
5. Wallaby — Australia.
6. Skunk — North America.
7. Beaver — Northern United States and Canada.
8. Bear — Northern United States and Canada.
9. Badger — Northern United States and Canada.
10. Fisher — Northern United States and Canada.
11. Otter — United States, Canada and Japan.

(The otter is a native of Russia, where its fur is highly prized.)

12. Wolverine — Canada.
13. Musk-ox — Canada.
14. Lynx — Canada.
15. Wolf — United States, Canada, Russia.
16. Mink — United States and Canada.
17. Muskrat — United States.
18. Wildcat — United States.
19. Raccoon — United States.
20. Ring-tailed cat — California.
21. American marten — Northern United States, Alaska, and Canada.
22. Opossum — America and Australia.
23. Nutria — South America.
24. Persian lamb — Western Asia.
25. Conies and hares — Belgium, France, Russia, and Australia.

(One million Siberian gray squirrels enter the fur markets of the world yearly.)

26. Marmot — Russia and Western Asia.
27. Foxes (silver, gray, white, blue, red) — Alaska, British America, Northern United States, Russia, and Japan.
28. Sable — Northern Europe.
29. Stone marten — Northern Europe.

The fur commerce of the United States amounts to twenty million dollars annually.

For many years the American bison or buffalo furnished valuable carriage- and lap-robes, the fur being very highly prized, and buffalo-meat was considered quite palatable. Countless thousands roamed over the grassy plains of the great West. To-day the buffalo is well-nigh extinct.

The world's best furs come from the animals of the polar regions of the earth.

London prices are fixed twice a year — in March and August — by a board composed of the leading fur dealers of this metropolis. Prices of furs throughout the commercial world, save Russia alone, are gauged according to this scale.

LEATHER COMMERCE.

Leather is made from the skins of animals. All flesh particles are removed from the skins, and they are next soaked in a lime solution which loosens the hair, so it can be removed. Next, the skins are soaked in barley or some weak acid solution to open up the pores of the skins. Then, dried oak or hemlock bark that has previously been reduced to a coarse powder is rolled up with the skins, and they are left for many weeks in a water bath. The skins become flexible and strong by this process, which is called tanning. The world's leather tanneries use millions of pounds of bark each year.

The oak has for centuries supplied tanneries with their bark. In Spain the inner bark of the cork oak (*Quercus suber*), in Egypt the African oak (*Q. coccifera*), in Great Britain, central Europe and the United States the white oak (*Q. alba*), red oak (*Q. rubra*), black oak (*Q. tinctoria*), burr oak (*Q. macrocarpa*), hemlock and birch furnish tanneries their barks. These barks are believed to give the leather good weight and make it firm and hard. The mimosa bark in Australia, willow bark in Russia, and mangrove bark in tropical countries, are much used for tanning leather.

When taken from the tanning-vats, the skins are thoroughly dried and made smooth by being passed between heavy rollers. In this way the skins of horses, cows, calves and oxen in Europe and America are converted into leather. The skins of wild animals of Mexico, Central America and South America and other countries, desired for leather, are similarly treated. The skins of goats found in Switzerland and Morocco are used to make morocco leather. The skins of young goats and lambs make kid leather, much used in glove manufactories. Sheepskin forms a soft leather much used by bookbinderies. Parchment, the earliest material for scrolls, is a kind of leather made from the skins of sheep and goats. This was the first leather made. The first copies of the Bible were made of parchment. The skins of calves furnish the material for vellum, a fine parchment. In ancient times this was much used for leaves of books.

The boot-and-shoe manufactories of England, Germany, France and the New England and central Mississippi States of our own nation use many million pounds of kangaroo, alligator, horse, cow and calfskin leather for uppers and oxhide for soles. Oxhide is also much used in the manufacture of harness.

European nations and the United States are the chief leather-producing countries of the world. These nations import hides from many lands, as they cannot meet the demand for leather with the home product. Europe annually imports eighteen million pounds of hides, chiefly from South America, Australia, and India. The leather manufactories of our own nation use all the product of our home tanneries, and now annually import over thirty-seven million dollars' worth of hides and leather. These come chiefly from the East Indies, Great Britain, France, Argentina, Germany, Russia, Brazil, Mexico, China, Canada, Uruguay, and Australia. The amount of purchase is, for 1900, in order named.

A new method of acid tanning was discovered in 1856, and used in the tanneries near Philadelphia. This has made that city the leather metropolis of the commercial world.

The ten leading cities in our nation engaged in the boot-and-shoe industry rank as follows: Lynn (Mass.), Brockton (Mass.), Haverhill (Mass.), Chicago, Philadelphia, Rochester, Marlboro (Mass.), New York, Cincinnati, St. Louis. (Statistics for 1890.)

The United States now manufactures upward of 260 million dollars' worth of boots and shoes annually, nearly one-half of which is the product of the Massachusetts factories. Boston is the metropolis of New England and New England manufactures two-thirds of the nation's boots and shoes. This makes Boston the greatest boot-and-shoe market in the nation.

While our exports of leather manufactures have increased 200 per cent. within the last ten years, yet we now export ten million dollars less of leather goods than we import in hides and skins.

Plucking the beautiful plumage from the famous Biped of the Desert, in South Africa.

IMPROVEMENTS IN THE NILE.

1. *Removal of Sudd.* The Nile river is a stream of great importance commercially to Egypt, both for its navigation and its annual sedimentary deposit from the yearly overflow. Above the city of Khartoum, mats of grass, papyrus and other water-plants interlace with trunks and limbs of the ambatch, a soft-wooded, leguminous tree, making dense masses of vegetation called sudd. In the White Nile, one of three branches of the upper Nile, British gunboats in 1898 found sudd completely obstructed navigation, the floating mass being on an average four feet thick. The Egyptian government organized a "sudd-cutting expedition," and placed Major Peake, of the English Royal Artillery, in command. The following extracts are taken from the Major's journal, and show the character of this work:

"When one arrives at a block it is very curious. All of a sudden the river ceases to be. Nothing but an exquisite greenness of tall papyrus about fourteen feet high entwined with convolvulus, the hippos and crocodiles disporting themselves, and numerous wonderful birds. . . . On arriving at a block we tie up the steamer and set everything on fire, then cut down all the dead papyrus, which is on the sudd, until it soon looks like a very rough field. Then this field is dug into small sections four or five yards square; the trenches are dug to about two feet under water, the sudd itself being from one to four feet above water and from six to ten underneath. Next we put pieces of wood round our section (cut-up telegraph poles), fix a wire hawser round the section, shoved well down in the trenches and behind the posts, and bring the two ends on the steamer. The steamer then backs astern, and eventually pulls out the section, which floats away down-stream. The wire is got on board again, the poles recovered, and the steamer proceeds for another section. The force and jerk which the steamer brings on the wire severs the roots of the section underneath from the others — or at least something does! . . .

"On the 3d [of March] the seventh block burst, and hundreds and hundreds of tons of sudd came tearing down, carrying my steamer and barge away with it. I had a most anxious time, as I was in a rather dangerous position — pitch-dark and no moon, simply surrounded by sudd, no water visible at all. After two hours I luckily managed to get hold of a bank, and hung on there. The sudd continued to stream down for two whole days and a night."

In January, 1900, Major Peake began his work on the Bahr-el-Gibel (White Nile) at 8° 34′ N. latitude, and on May 17th of the same year he telegraphed that he had opened up navigation to Uganda, which cleared the Nile of its sudd. This has proven a great advantage in carrying civilization and trade to the Soudanese tribes of the interior, while it has reclaimed the Upper Nile for a highway of commerce.

2. *The Dams of the Nile.* The ancient Egyptians built many canals and waterways that led from the Nile. These ofttimes reclaimed barren wastes and widened the fertile portions of the valley. During Joseph's rule in Egypt the Nile improvements were quite extensive, one waterway, the Bahr Yussuf (Water of Joseph), has survived the demolition of the centuries.

Napoleon is said to have remarked, when he visited Egypt at the close of the eighteenth century, that a dam at Cairo would double the area of tillable land in the delta. Later, a French engineer was secured by ruler Mehemet Ali to draw up plans for this work. The purpose was to increase the area of cotton and sugar land by constructing two barrages, one in the Damietta and the other in the Rosetta mouth of the Nile. Lack of funds

and skilled labor prevented the completion of the construction plans. After twenty years' work the extensive viaduct of arches was completed, and the sluices closed. When the Nile was at its flood, the great structure cracked in all directions and threatened to actually collapse. To prevent this, the sluices were opened, and the river reduced to its normal height. The dam was saved, but it was rendered useless.

Sir Colon Moncrieff and Mr. Willcocks — two talented British engineers — later bored beneath the piers and made a firm foundation for these barrages in the river-bed, overhauled the Frenchman's structure, and put the whole in such a good state of repair that since 1889 the barrages have fulfilled their mission and the money thus expended has been returned many fold in the increased area of tillable land in the delta.

The success of the Cairo dam led engineers to discuss the feasibility of storing the water of the upper Nile. The designer of the great Firth bridge — Sir Benjamin Baker,— Sir John Aird, England's greatest contractor, and Mr. Ernest Cassel, London's greatest financier, were interested in the Upper Nile improvements, and when they proposed to build two dams and a number of irrigating canals the government accepted the proposal. The river at Assouan is a mile wide. To render the foundation sufficiently strong, the river was turned from its course, and a huge trench dug 100 feet deep and filled with concrete rubble. Upon this solid bed were built the granite piers that support this mile and one-quarter viaduct. The 180 sluices of the Assouan dam have the Stoney steel doors, the mechanism of which is so nicely adjusted that a lever which a child can work raises and lowers these heavy water-gates. This dam stores one billion tons of water, and the wall, rising 90 feet above low Nile, gives a lake that will fertilize both sides of the river's valley for 140 miles.

Between 300 and 400 miles below Assouan is Assiout, where another remarkable reservoir is located. The dam is here laid on a foundation of solid masonry in the bed of the river, forty feet below low-water level. The wall is eighty-seven feet wide and one-half mile long. To prevent any undermining of the dam, large cast-iron piles were driven into the bed of the river thirteen feet, both above and below the dam. The sluices of the Assiout weir number 111, with sluice-gates similar to the water-gates of the Assouan weir. To the west of the dam, a navigation lock permits the traffic of the Upper Nile to pass unimpeded through a fifty-foot passage. Thus these dams are no obstruction to commerce, while their irrigating waters add fully two and one-half thousand miles of fertile land to the Nile valley.

What the Pyramids were to the ancient world, the sudd dredging and Nile dams are to the engineering and commercial world to-day.

COMMERCIAL MUSEUMS.

The commercial museum is established to foster a nation's trade. It gives the producer the best method of packing his wares, cost of transportation and trade conditions in advantageous foreign markets. It shows the exporter how to introduce his merchandise where foreign weights and measures prevail. It also furnishes him lists of desirable trade dealers in all parts of the world. Museums often have samples of raw materials as well as manufactured goods from every country of the commercial world. Museums receive the consular reports of commercial nations, and from these sources make reliable statistics of trade. This makes the museum an emporium of knowledge on commerce. Many museums send investigators to foreign ports to study trade conditions. Through these specialists and the consular statements the museum gains the information that will help its nation meet the demand for goods in new markets.

European countries were the first nations to see the advantages of trade obtained through commercial museums. The leading museums are located as follows:

Great Britain	1	Italy	7
Belgium	9	Turkey	1
Holland	4	Greece	2
Germany	17	Japan	1
Austria	3	United States	1
France	26		

Some museums are directed by province or national supervision, some by chambers of commerce, and some by private enterprise. The museum established at Vienna, Austria, in 1880, is undoubtedly the most influential museum in the world at the present time.

The commercial museum of our own nation was established at Philadelphia by ordinance of that city's council, June 15, 1894. It is supported largely by municipal appropriations. Its board of trustees numbers fourteen of the most prominent business men of Philadelphia, with the Governor of Pennsylvania, Mayor of Philadelphia, and six other State and city officials as *ex officio* members of the board. An advisory board numbers representatives of the leading commercial organizations of this nation and such other nations as have direct trade through corporative interests with the United States. This board helps to make the work of the museum international in its general scope.

The museum does not engage in trade itself, is non-political in organization, and derives no profit from any of its many lines of work, all charges for special service being based on the actual cost. Prices current and market reports from all important centers of commerce are always on file, while more than 20,000 books and pamphlets give information on trade elements of the entire business world. The museum publishes a weekly bulletin giving valuable information on foreign trade opportunities.

This museum is in close touch with the chamber of commerce in over 300 foreign cities as well as all leading commercial cities of our own land. The following incidents show the object lessons taught by the samples of foreign manufactures shown at the museum:

A Pennsylvania manufacturer of plows while looking through the Argentine samples in the museum, saw the primitive plow made and sold there. Within two years he had opened a trade in that region and sold 20,000 of his plows.

A glass-maker passing through the sample-room of the museum found a sample of his own glassware in a foreign exhibit. On investigation, he found that an English firm had for years been selling his glassware in Australia at such an advance over his factory price that they made a good profit. The glass-maker soon opened a good trade with Australia, shipping from the factory to dealers in this South Sea nation.

The commercial collection of the Philadelphia museum presents the manufactures of foreign nations in more than a thousand different lines.

This museum has made up sets of statistical literature, maps and photographs, and placed them in several hundred Pennsylvania schools. These exhibits quicken geographical study along commercial lines. Loan exhibits are sent to many cities to instruct those interested in foreign products and manufactures. In one department of the Philadelphia museum are found American and foreign catalogues. The American catalogues give foreign merchants the products of American factories, and the foreign catalogues tell our American manufacturer what goods are produced by his competitors in other countries.

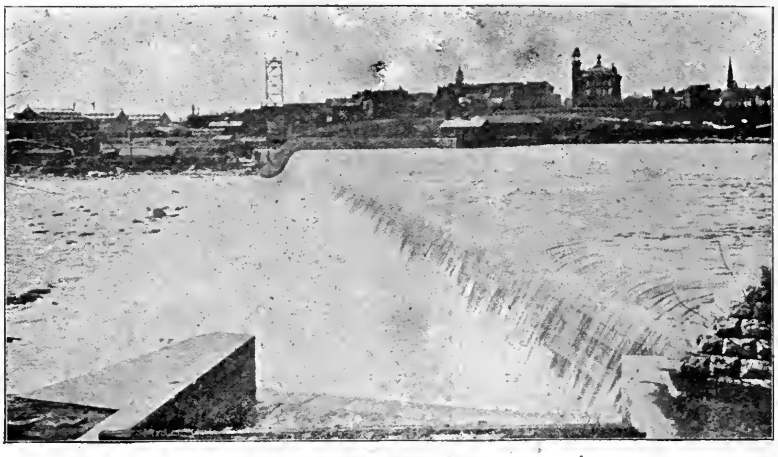
A Swiss Home and its Home-Maker.

The President's Flag and East Room Decorations, Army and Navy Reception, Washington, U. S. A.

The natural products of foreign countries comprise many hundred thousands of specimens. This collection is classified by nation and character of the product. Adjoining this room are the laboratories, where the industrial value of each product is determined.

Although our commercial museum is but a comparatively new institution, it is considered by foreign as well as home students of commerce as a model museum, and a major factor in our rapidly expanding commerce. The Department of State has recognized our commercial museum by instructing United States consuls to assist the museum in its work in foreign marts of trade.

The Philadelphia museum is to the United States what the Imperial Institute is to the British empire — a national factor in its commercial development.



The New Holyoke (Mass.) Dam.

NATURAL FEATURES THAT INFLUENCE COMMERCE.

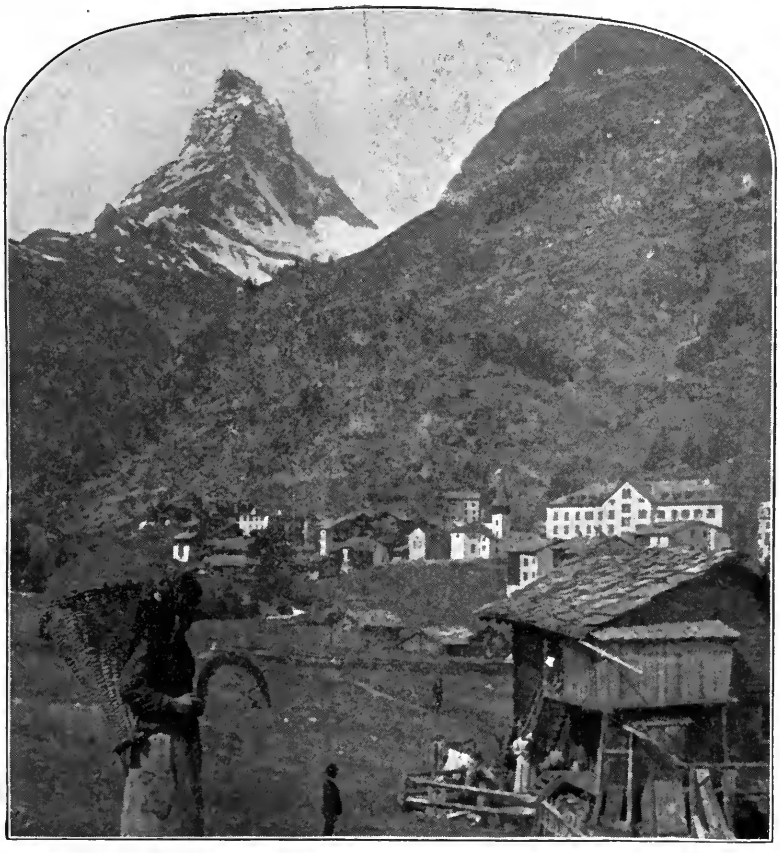
Navigable Rivers of Importance.

Name.	Length, in miles.	Area of Basin, in sq. miles.
1. Amazon	3400	2,320,000
2. Kongo	2500	1,500,000
3. Yenesei	3000	1,400,000
4. Nile	3900	1,300,000
5. Mississippi	4200	1,250,000
6. La Plata	2500	1,150,000
7. Obi	3000	1,100,000
8. Niger	2900	1,000,000
9. Lena	2800	900,000
10. Amur	2700	780,000
11. Yangtse	3100	690,000
12. Mackenzie	2400	680,000
13. Ganges-Brahmaputra	1800	600,000
14. Volga	2300	590,000
15. Zambesi	1600	580,000
16. St. Lawrence	2100	565,000
17. Euphrates	2000	490,000
18. Nelson-Saskatchewan	1900	470,000
19. Orinoco	1500	425,000
20. Hoang	2800	390,000
21. Yukon	2000	380,000
22. Indus	1900	360,000
23. Murray	1100	350,000
24. Danube	1800	320,000
25. Columbia	1400	290,000
26. Mekong	2600	280,000
27. Orange	1200	270,000
28. Rio Grande	1800	230,000
29. Colorado	1000	230,000
30. San Francisco	1800	210,000
31. Dneiper	1300	197,000
32. Irawadi	1200	180,000
33. Rhine	965	90,000
34. Rhone	550	33,000

Locate, give source, direction, mouth, and name commercial cities situated on each river.

Lakes of Commercial Importance.

Name.	Depth.	Altitude.	Area in sq. miles.
1. Caspian	3100	—85	169,000
2. Victoria	620	4000	32,000
3. Superior	1008	602	31,000
4. Aral	220	158	26,000
5. Huron	702	581	24,000
6. Michigan	870	581	22,000
7. Tanganyika	1300	2670	14,000



The "Alpine Spirit's" Sanctuary. The Charming Zermatt and the Matterhorn, Switzerland.

Lakes of Commercial Importance.—*Continued.*

Name.	*Depth.*	*Altitude.*	*Area in sq. Miles.*
8. Baikal	4500	1400	13,000
9. Tchad	20	1100	10,000
10. Erie	210	573	10,000
11. Winnipeg	72	710	9000
12. Balkash	135	900	8500
13. Ontario	738	247	7000
14. Ladoga	732	55	7000
15. Titicaca	925	12,500	3000
16. Nicaragua	320	108	3000
17. Great Salt	50	4200	2000
18. Chapala	—	7000	1300
19. Dead Sea	1300	—1290	350

Locate, state facts showing commercial value, and name ports located upon each lake.

Most Important Mountain Peaks.

Name and Location.	*Height, in feet.*
1. Everest (Asia)	29,002
2. Aconcagua (South America)	23,910
3. Sahama (South America)	22,350
4. Sorato (South America)	21,286
5. Chimborazo (South America)	20,517
6. McKinley (North America)	20,464
7. Kilimanjaro (Africa)	20,000
8. Logan (North America)	19,500
9. Demavend (Asia)	18,846
10. Orizaba (North America)	18,314
11. St. Elias (North America)	18,100
12. Kenia (Africa)	18,000
13. Popocatapetl (North America)	17,784
14. Cotopaxi (South America)	16,291

"Old Faithful" Geyser, Yellowstone Park.

Locate in the continent and mountain system. Name some facts interesting or instructive about each peak, and state what effect the mountain range in which each peak is located has upon civilization or commerce.

The Greatest Natural Wonders.

Name. — *Location.*

1. Glaciers — Canada, B. A.; Washington, U. S. A.; Switzerland, Europe.
2. Geysers — Iceland, Danish America; Yellowstone Park, U. S. A.; New Zealand, Australasia.
3. Mt. Brocken — Germany, Europe.
4. The Boiling Mountain — Ecuador, S. A.
5. Kilhorn Peak — Norway, Europe.
6. Glass Mountain — Yellowstone Park, U. S. A.
7. Profile Mountain—Franconia, Germany.
8. Pitch Lake — Trinidad, West Indies.
9. The Maelstrom — Off Lafoden Islands, Europe.

Most Important Mountain Peaks.—*Continued.*

Name and Location.	*Height, in feet.*
15. Whitney (North America)	14,890
16. Rainier (North America)	14,526
17. Pike's Peak (North America)	14,147
18. Blanc (Europe)	15,744
19. Fujiyama (Asia)	14,177
20. Vesuvius (Europe)	14,205
21. Mauna Kea (Hawaii)	13,953
22. Matterhorn (Europe)	14,705
23. Etna (Europe)	10,875
24. Hecla (Iceland)	5,108
25. St. Gothard (Europe)	10,000
26. Cenis (Europe)	11,000
27. Stromboli (Europe)	3,000
28. Washington (North America)	6,288
29. Shasta (North America)	14,350
30. Hood (North America)	11,934
31. Fremont's (North America)	13,790
32. Mitchell (North America)	6,710

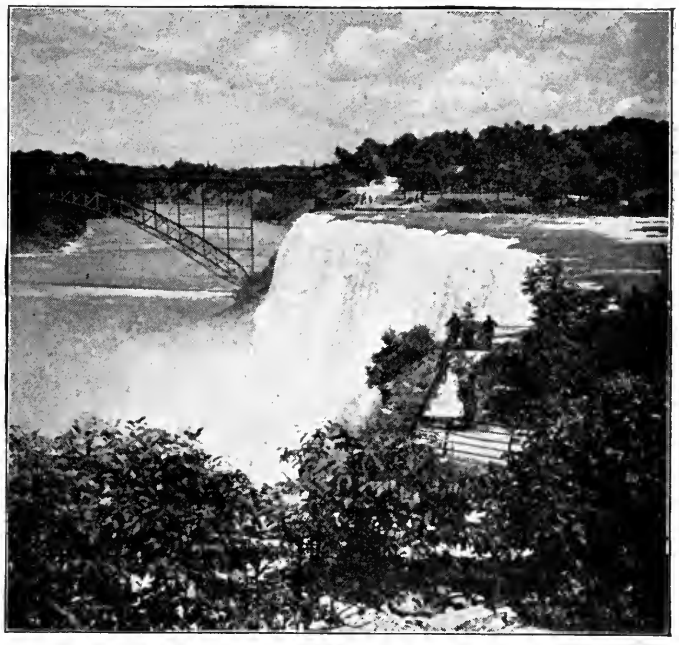
Royal Gorge, Grand Canyon of the Arkansas, Colorado, U. S. A.

The Greatest Natural Wonders.—*Cont.*

Name. *Location.*

10. Aurora Borealis as seen in Danish America.
11. Garden of the Gods—Colorado, U. S. A.
12. Lost River — Indiana, U. S. A.
13. Pictured Rocks—Lake Superior, U. S. A.
14. Giant's Causeway — Ireland, Europe.
15. Grand Canyon — Colorado river, U. S. A.
16. Palisades of Hudson river, U. S. A.
17. Yosemite Valley — California, U. S. A.
18. The Mariposa Big Trees — California, U. S. A.
19. Trees and animals of Australia.
20. Watkins Glen — New York, U. S. A.
21. Bad Lands — South Dakota and Nebraska, U. S. A.
22. The Great Spring — Florida, U. S. A.
23. Hot Springs — Arkansas, U. S. A.
24. Sutherland Falls — New Zealand.
25. Grand River Falls — Labrador, N. America.

Niagara Falls in Winter.



Niagara Falls in Summer.

The Greatest Natural Wonders.—*Cont.*

Name. *Location.*

26. Falls of Niagara river—North America.
27. Multnomah Falls — Oregon, U. S. A.
28. Snoqualmie Falls—Washington, U. S. A.
29. Victoria Falls — Zambesi river, Africa.
30. Stambach Falls — Switzerland, Europe.
31. Falls of St. Anthony—Minnesota, U. S. A.
32. Echo Canyon — Utah, U. S. A.
33. Echo Cave — Mexico, North America.
34. Mammoth Cave — Kentucky, U. S. A.
35. Wyandotte Cave — Indiana, U. S. A.
36. Luray Cave — Virginia, U. S. A.
37. Fingal's Cave — Isle of Staffa, Europe.
38. Howe's Cave — New York, U. S. A.
39. Nicojack Cave — Georgia, U. S. A.
40. Cave of Adelsburg — Austria, Europe.
41. Grotto of Capri — Italy, Europe.
42. Natural Bridges—Virginia, Alabama, California, U. S. A.
43. Vichy Springs — France, Europe.
44. Lake Cirknitzer — Austria, Europe.

Looking through the great Forth Bridge (8300 feet long), Scotland.

The Greatest Natural Wonders.—*Continued.*

	Name.	*Location.*
45.	Indian Mounds	Ohio and Mississippi, U.S.
46.	Pyramids	Egypt, Africa.
47.	Leaning Tower	Pisa, Italy, Europe.
48.	Wall of China	Asia.
49.	St. Gothard Tunnel	Alps.
50.	Mt. Cenis Tunnel	Alps.
51.	Simplon Tunnel	Alps.
52.	Cascade Tunnel	Cascade Mountains, U. S. A.
53.	Hoosac Tunnel	Hoosac Mountains, U. S. A.
54.	Alpine Tunnel	Rocky Mountains, U. S. A.

An Alaskan Volcano.

In the Bering sea, about midway between the Aleutian and Pribilof Islands, is a peculiar volcanic center. Here was thrown up a volcanic island in 1796. In a shroud of steam and fog in 1883 waters in this region were parted by a volcano that sprang into being, rising to a height of 500 feet.

These two volcanoes, old and new Bogslof, are the resting-places of myriads of sea birds and the playground for multitudes of sea lions.

Oceans.

Name.	*Area, sq. miles.*
1. Pacific	71,000,000
2. Atlantic	34,000,000
3. Indian	28,000,000
4. Antarctic	7,000,000
5. Arctic	4,000,000

Give facts on the commercial importance of each ocean. Which is the greatest ocean of commerce today? Why?

Principal Plateaus of the World.

Name.	*Location.*	*Height, in feet.*
1. Thibet,	Chinese Empire	15,000–17,000
2. Pamir (Roof of the World),	Northeast Afghanistan	14,000–16,000
3. Bolivian,	Bolivia	12,500–14,000
4. Mexican,	Mexico	6500–8000
5. Abyssinian,	Abyssinia	6500–8000
6. Colorado,	Colorado	5000–8000
7. Iran,	Persia	3000–6000
8. Alpine Plateau,	South-Central Europe	3500–4000
9. Spanish,	Spain	3000
10. Guiana,	Guiana	2000–3000
11. South African,	South Africa	2000–3500
12. Desert Plateau,	Central Sahara,	2500
13. Asia Minor,	Asia Minor	1500–2000
14. Brazilian,	Brazil	2000–2800
15. Arabian,	Arabia	1000–2000

Bogslof Volcano, Bering Sea, U. S. A.

COLONIES, DEPENDENCIES AND PROTECTORATES OF THE COMMERCIAL WORLD.

Names of countries controlling these colonies and dependencies, with area and population of latter. (U. S. Bureau of Statistics.)

Countries.	*No. of Colonies.*	*Area of Colonies (sq. miles).*	*Population of Colonies (in thousands).*
1. Great Britain	48	11,250,412	344,059
2. France	32	3,617,321	52,643
3. Germany	3	802,863	33,912
4. Portugal	9	801,060	9,217
5. Spain	3	245,877	256
6. Italy	2	104,000	650
7. Austria	2	23,262	1,568
8. Denmark	3	86,614	114
9. Russia	3	255,550	5,684
10. Turkey	4	564,500	17,489
11. China	5	2,881,560	16,680
12. United States	6	168,287	10,177
Totals	128	21,821,382	503,049

Colonies by Continents.

NORTH AMERICA.

Names.	*Nation in Control.*
Bahamas	Great Britain.
Barbadoes	Great Britain.
Bermudas	Great Britain.
Canada	Great Britain.
Curaçao	Netherlands.
Greenland	Denmark.
Guadeloupe	France.
Honduras, British	Great Britain.
Jamaica	Great Britain.
Leeward Islands	Great Britain.
Martinique	France.
Newfoundland	Great Britain.
Porto Rico	United States.
St. John	Denmark.
St. Pierre and Miquelon	France.
St. Thomas	Denmark.
Saint Croix	Denmark.
Trinidad	Great Britain.
Windward Islands	Great Britain.

SOUTH AMERICA.

Names.	*Nation in Control.*
Falkland Islands	Great Britain.
Guiana, British	Great Britain.
Guiana, French	France.
Guiana, Dutch	Netherlands.

EUROPE.

Names.	*Nation in Control.*
Bosnia	Austria.
Bulgaria	Turkey.
Faeroe Islands	Denmark.
Gibraltar	Great Britain.
Herzogovina	Austria.
Iceland	Denmark.
Mala and Gozo	Great Britain.
Roumelia	Turkey.

ASIA.

Names.	*Nation in Control.*
Aden and Perim	Great Britain.
Anam	France.
Bahreim Islands	Great Britain.
Baluchistan	Great Britain.
Bokhara	Russia.
Cambodia	France.
Ceylon	Great Britain.
China dependencies (Manchuria, Mongolia, Tibet, Jungaria, East Turkestan)	China.
Cochin China	France.
Hong Kong	Great Britain.
India, British	Great Britain.
India, French (area only 200 square miles)	France.
India, Portuguese (area 1295 square miles)	Portugal.
Khiva	Russia.
Macao	Portugal.
Malay (federated native states)	Great Britain.
Samos	Turkey.

Sikkim — Great Britain.
Straits Settlements — Great Britain.
Tonquin — France.

AFRICA.

Names. *Nation in Control.*

Algeria — France.
Angola — Portugal.
Ascension — Great Britain.
Azores and Madeira Islands — Portugal.
Basutoland — Great Britain.
Bechuanaland — Great Britain.
British East Africa — Great Britain.
British Central Africa — Great Britain.
British South Africa — Great Britain.
Canary Islands — Spain.
Cape Colony — Great Britain.
Cape Verde Islands — Portugal.
Ceuta — Spain.
Comoro Islands — France.
Dahomey — France.
Egypt — Turkey.
Erythrea — Italy.
Fernando Po — Spain.
French Sudan — France.
Gaboon Congo — France.
Gambia — Great Britain.
German East Africa — Germany.
German S. W. Africa — Germany.
Gold Coast, British — Great Britain.
Gold Coast, French — France.
Kamerun — Germany.
Kongo Free State — Belgium (protectorate).
Lagos — Great Britain.
Logoland — Germany.
Madagascar — France.
Mauritius and dependencies — Great Britain.
Mayotte and Nossi Be — France.
Mozambique — Portugal.
Natal — Great Britain.
Niger Territories — Great Britain.
Obock and Tajura — France.
Providence Island — Germany.
Reunion — France.
St. Helena — Great Britain.
St. Marie — France.
Senegambia — France.
Sierra Leone — Great Britain.
Somali — Great Britain.
The Transvaal Country — Fighting Great Britain for absolute independence.
Tripoli — Turkey.
Tristan d'Acunha — Great Britain.
Tunis — France.
Uganda — Great Britain.
Zanzibar — Great Britain.
Zululand — Great Britain.

AUSTRALASIA.

Names. *Nation in Control.*

Bismarck Archipelago — Germany.
Borneo, British North — Great Britain.
Borneo, Dutch — Netherlands.
Caroline Islands and Palaos — Spain.
Emperor William's Land — Germany.
Fiji and Rotuma Isles — Great Britain.
Guam — United States.
Hawaii — United States.
Java and Madura — Netherlands.
Marquesas Islands — France.
New Guinea, British — Great Britain.
New Guinea, Dutch — Netherlands.
New South Wales — Great Britain.
New Zealand — Great Britain.
Philippine Islands — United States.
Queensland — Great Britain.
Samoan Islands — Germany and United States.
South Australia — Great Britain.
Society Islands and dependencies — France.
Sumatra — Netherlands.
Tasmania — Great Britain.
Timorard Archipelago — Netherlands.
Tutuila — United States.
Victoria — Great Britain.
Wake Island — United States.
West Australia — Great Britain.

Our Territorial Possessions.

1. Hawaii.—Area, 4210 square miles.

Maui, 760 square miles.
Oahu, 600 square miles.
Kauai, 590 square miles.
Molkai, 270 square miles.
Lauai, 150 square miles.
Nihau, 97 square miles.
Kahoolawe, 63 square miles.

The exportation of sugar in 1897 was 520 million pounds, coffee exportation was 337,000 pounds, and rice exportation the same year was 5½ million pounds. Nearly all the necessities of life have to be imported. There are 71 miles of railroad and 250 miles of telegraph in the islands. The present territorial government was inaugurated at Honolulu, June 14th, 1900. The inauguration of Governor Dole took place at the capitol steps.

Scotland's Pride—the great Forth Bridge and the Highland Kilt.

The islands form a territory styled the Territory of Hawaii, and are attached to the department of California. The Legislature of the Territory consists of two houses — a Senate of 15 members, elected for four years, and a House of Representatives of 30, elected for two years. The Legislature meets biennially, and its sessions are limited to sixty days. The capital is Honolulu, a city of nearly 40,000.

2. Wake Island. (See page 105.)

3. Guam. This is the largest island of the Ladrone Archipelago, and lies directly in the trade route from San Francisco to the Philippine Islands. The island is 32 miles long and 100 miles in circumference. The capital is Agana, a city of 5000. The island is a military territory, whose governor is appointed by the President of the United States. It is valuable as a coaling station, and is a base of naval supplies for the United States navy.

4. Tutuila. (See page 102.)

5. Philippines. (See page 115.)

6. Porto Rico. This island is the most eastern of the Greater Antilles of the West Indian archipelago. The United States flag was raised over the Governor's palace, San Juan, October 18, 1898. The island is 1000 miles from Havana; is 108 miles long, east and west, and averages 40 miles in width, north and south. Its area is about one-half the area of the State of New Jersey. It has 137 miles of railway, and 170 more under construction. Nearly 500 miles of telegraph have been built in the island. San Juan, the capital, has cable connection with Jamaica and St. Thomas.

Porto Rico was organized as a civil territory May 1st, 1900. The Governor appointed by the

President of the United States holds office for four years, with the power usually given Territorial governors. In the government of the island he is assisted by an executive council composed of a secretary, attorney-general, treasurer, auditor, commissioner of the interior, commissioner of education, and five native Porto-Ricans. These constitute the upper house of the Legislative Assembly. The House of Deputies, composed of 35 members elected for two years constitutes the other branch of the Legislative Assembly.

San Juan is a city of 32,000. Ponce, with 28,000, and Arecibo, with 30,000 inhabitants, are important commercial centers.

Porto Rico is extremely fertile. The principal occupations are lumbering and agriculture. Coffee constitutes 63 per cent. of the exports from the island; sugar, 28 per cent.; while tobacco, honey, molasses, cattle, timber and hides follow as important exports, in order named.

Porto Rico, Hawaii and the Philippines furnish our nation a large amount of its tropical and subtropical imports, and afford a good market for important agricultural and manufactured exports. Thus our nation receives through these possessions valuable elements of trade, and enters the new century with greatly increased commercial resources and power.

United States Capitol, Washington, D. C., U. S. A.

STATE AND TERRITORIAL STATISTICS.

States.	*Capitals.*	*Largest Cities.*	*Date of Admission or Ratification of United States Constitution.*	*Area, in Square Miles.*	*Population, 1900.*
Alabama	Montgomery	Mobile	Dec. 14, 1819	52,250	1,828,697
Arkansas	Little Rock	Little Rock	June 15, 1836	53,850	1,311,564
California	Sacramento	San Francisco	Sept. 9, 1850	158,360	1,485,053
Colorado	Denver	Denver	Aug. 1, 1876	103,925	539,700
Connecticut	Hartford	New Haven	Jan. 9, 1788	4,990	908,420
Delaware	Dover	Wilmington	Dec. 7, 1787	2,050	184,735
Florida	Tallahassee	Jacksonville	March 3, 1845	58,680	528,542
Georgia	Atlanta	Atlanta	Jan. 2, 1788	59,475	2,216,331
Idaho	Boise	Boise	July 3, 1890	84,800	161,772
Illinois	Springfield	Chicago	Dec. 3, 1818	56,650	4,821,550
Indiana	Indianapolis	Indianapolis	Dec. 11, 1816	36,350	2,516,462
Iowa	Des Moines	Des Moines	Dec. 28, 1846	56,025	2,231,853
Kansas	Topeka	Kansas City	Jan. 29, 1861	82,080	1,470,495
Kentucky	Frankfort	Louisville	June 1, 1792	40,400	2,147,174
Louisiana	Baton Rouge	New Orleans	April 30, 1812	48,720	1,381,625
Maine	Augusta	Portland	March 15, 1820	33,040	694,466
Maryland	Annapolis	Baltimore	April 28, 1788	12,210	1,188,044
Massachusetts	Boston	Boston	Feb. 7, 1788	8,315	2,805,346
Michigan	Lansing	Detroit	Jan. 26, 1837	58,915	2,420,982
Minnesota	St. Paul	Minneapolis	May 11, 1858	83,365	1,751,394
Mississippi	Jackson	Vicksburg	Dec. 10, 1817	46,810	1,551,270
Missouri	Jefferson City	St. Louis	Aug. 10, 1821	69,415	3,106,665
Montana	Helena	Butte	Nov. 8, 1889	146,080	243,329
Nebraska	Lincoln	Omaha	March 1, 1867	77,510	1,066,300
Nevada	Carson City	Reno	Oct. 31, 1864	110,700	42,335
New Hampshire	Concord	Manchester	June 21, 1788	9,305	411,588
New Jersey	Trenton	Newark	Dec. 18, 1787	7,815	1,883,669
New York	Albany	New York	July 26, 1788	49,170	7,268,894
North Carolina	Raleigh	Wilmington	Nov. 21, 1789	52,250	1,893,810
North Dakota	Bismarck	Fargo	Nov. 2, 1889	70,795	319,146
Ohio	Columbus	Cleveland	Feb. 19, 1803	41,060	4,157,545
Oregon	Salem	Portland	Feb. 14, 1859	96,030	413,536
Pennsylvania	Harrisburg	Philadelphia	Dec. 12, 1787	45,215	6,302,115
Rhode Island	Providence	Providence	May 29, 1790	1,250	428,556
South Carolina	Columbia	Charleston	May 23, 1788	30,570	1,340,316
South Dakota	Pierre	Sioux Falls	Nov. 2, 1889	77,650	401,570
Tennessee	Nashville	Memphis	June 1, 1796	42,050	2,020,616
Texas	Austin	San Antonio	Dec. 29, 1845	265,780	3,048,710
Utah	Salt Lake City	Salt Lake City	Jan. 4, 1896	84,970	276,749
Vermont	Montpelier	Burlington	March 4, 1791	9,565	343,641
Virginia	Richmond	Richmond	June 25, 1788	42,450	1,854,184
Washington	Olympia	Seattle	Nov. 11, 1889	69,180	518,103
West Virginia	Charleston	Wheeling	June 20, 1863	24,780	958,800
Wisconsin	Madison	Milwaukee	May 29, 1848	56,040	2,069,042
Wyoming	Cheyenne	Cheyenne	July 10, 1890	97,890	92,531
	Area of Delaware and New York Bays and Part of the Great Lakes,			65,897	.....
Territories.			*Date of Organization.*		
Alaska	Sitka	Nome	July 27, 1868	590,884	63,592
Arizona	Phœnix	Tucson	Feb. 24, 1863	113,020	122,931
District of Columbia	Washington	Washington	March 30, 1791	70	278,718
Hawaii	Honolulu	Honolulu	April 30, 1900	6,449	154,001
Indian	.....	Ardmore	June 30, 1834	31,400	392,060
New Mexico	Santa Fe	Albuquerque	Sept. 9, 1850	122,580	195,310
Oklahoma	Guthrie	Oklahoma	May 2, 1890	39,030	398,331
Colonial Possessions.				3,688,110	76,212,168
Porto Rico	San Juan	San Juan	.....	3,531	953,243
Philippine Islands	Manila	Manila	.....	*114,410	*8,000,000
Tutuila, etc.	.....	.....	.....	77	6,100
Guam	.....	.....	.....	150	9,000
Wake	.....	.....	.....	1	.....
	In United States service abroad			.....	91,219
UNITED STATES	WASHINGTON	.....	July 4, 1776	3,806,279	85,271,730

* Estimated.

THE GOVERNMENTS OF THE WORLD AND THEIR RULERS.

(Authority on Statistics, Rand way, 1901.)

Country.	Population.	Capital.	Official Head.	Title.
Abyssinia	3,500,000	Addis Abeba	Menelek II	King.
Afghanistan	4,550,000	Kabul	Habib Ullah	Ameer.
Argentine Republic	4,574,000	Buenos Aires	Julio A. Roca	President.
Austria-Hungary	46,912,000	Vienna / Budapest	Franz Joseph I	Emperor.
Belgium	6,815,000	Brussels	Leopold II	King.
Bolivia	2,270,000	Sucre	Jose M. Pando	President.
Brazil	14,334,000	Rio de Janeiro	M. F. de Campos Salles	President.
British South Africa[1]	6,506,000		Sir Alfred Milner	High Commissioner.
Bulgaria	3,311,000	Sofia	Ferdinand	Prince.
Chile	3,110,000	Santiago	Federico Errazuriz	President.
Chinese Empire[2]	330,130,000	Peking	Kwangsu	Emperor.
Colombia	4,000,000	Bogota	Jose M. Marroquin	President.
Costa Rica	310,000	San Jose	Rafael Iglesias	President.
Denmark	2,448,000	Copenhagen	Christian IX	King.
Ecuador	1,272,000	Quito	Eloy Alfaro	President.
Egypt (Proper)	9,735,000	Cairo	Abbas Hilmi	Khedive.
France	38,600,000	Paris	Emile Loubet	President.
German Empire[3]	56,345,000	Berlin	Wilhelm II	Emperor.
Great Britain and Ireland[4]	41,606,000	London	Edward VII	King.
Commonwealth of Australia[5]	3,778,000	Melbourne[6]	Earl of Hopetoun	Governor-General.
British India, etc	299,933,000	Calcutta	Lord Curzon	Governor-General.
Dominion of Canada	5,339,000	Ottawa	Earl of Minto	Governor-General.
Greece	2,434,000	Athens	Georgios I	King.
Guatemala	1,574,000	New Guatemala	Manuel E. Cabrera	President.
Haiti	1,211,000	Port au Prince	T. Simon Sam	President.
Honduras	588,000	Tegucigalpa	Terencio Sierra	President.
Italy[7]	32,450,000	Rome	Vittorio Emanuele III	King.
Japanese Empire	46,495,000	Tokyo	Mutsuhito	Mikado.
Korea	9,670,000	Seoul	Yi Heui	Emperor.
Liberia	1,400,000	Monrovia	G. W. Gibson	President.
Luxemburg	218,000	Luxemburg	Adolf of Nassau	Grand Duke.
Mexico	13,571,000	Mexico	Porfirio Diaz	President.
Monaco	15,000	Monaco	Albert	Prince.
Montenegro	229,000	Cetinje	Nicholas I	Prince.
Morocco	5,000,000	Fez, Morocco,	Mulai-Abd-el-Aziz	Sultan.
Netherlands	5,104,000	The Hague	Wilhelmina	Queen.
Nicaragua	500,000	Managua	J. Santos Zelaya	President.
Oman	1,000,000	Maskat	Feysal bin Turki	Sultan.
Paraguay	636,000	Asuncion	Emilio Aceval	President.
Persia	9,000,000	Teheran	Muzaffar-ed-din	Shah.
Peru	4,610,000	Lima	E. L. de Romana	President.
Portugal	4,660,000	Lisbon	Carlos I	King.
Roumania	5,913,000	Bukharest	Carol I	King.
Russia[8]	130,925,000	St. Petersburg	Nicholas II	Emperor.
Salvador	916,000	San Salvador	Tomas Regalado	President.
Santo Domingo	610,000	Santo Domingo	Juan I. Jiminez	President.
Servia	2,535,000	Belgrade	Alexander I	King.
Siam	6,320,000	Bangkok	Chulalongkorn I	King.
Spain	18,079,000	Madrid	Maria Christina	Queen Regent.
Sweden and Norway	7,329,000	Stockholm / Christiania	Oscar II	King.
Switzerland	3,314,000	Bern	Joseph Zemp	President.
Turkey[9]	23,045,000	Constantinople	Abdul-Hamid II	Sultan.
United States	85,272,000	Washington	Theodore Roosevelt	President.
Uruguay	900,000	Montevideo	Juan L. Cuestas	President.
Venezuela	2,445,000	Caracas	Cipriano Castro	President.

[1] Includes Cape of Good Hope, Basutoland, Natal, Rhodesia, Bechuanaland Protectorate, Central Africa Protectorate, Orange River Colony, and Transvaal Colony.

[2] Includes China proper, Manchuria, Mongolia, Chinese Turkestan, and Tibet.

[3] Includes the confederation of German States, and Principalities under the Constitution of the Empire.

[4] Includes England, Wales, Scotland, Ireland, Isle of Man, and Channel Islands.

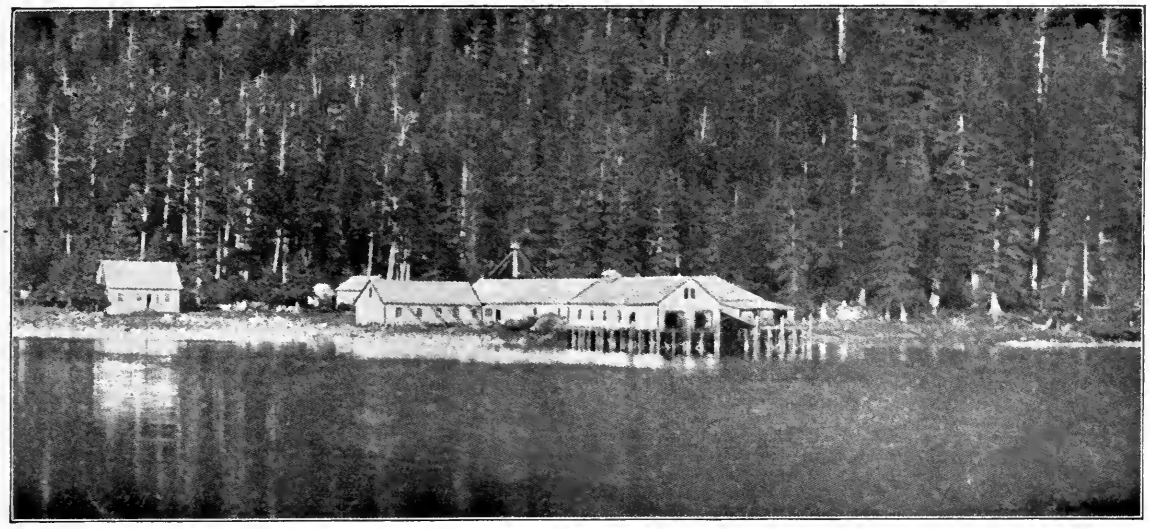
[5] Includes the former Australian Colonies and Tasmania.

[6] The temporary capital of The Australian Federation, pending the location of a federal district and building of a capital city.

[7] Includes Italy proper, Sicily, and Sardinia.

[8] Includes Russia in Europe and all the Russian possessions in Asia.

[9] Includes Turkey in Europe, in Asia, and in Africa.



Salmon-Canning in Alaska.

UNITED STATES MAIL CONNECTIONS WITH THE COMMERCIAL WORLD.

The Universal Postal Union was formed in 1874. For two cents an ounce a letter can be sent to any postoffice in Canada, Mexico, and the United States. For five cents an ounce or fraction thereof, a letter can be sent to any nation in the Postal Union.

The Superintendent of Foreign Mails dispatches the mails for foreign countries by the fastest steamers. The principal mail steamer lines connecting our leading ports with the commercial world are here named, both our nation's port and the port of destination of mail steamer being given.

Transatlantic Mails.

Name of Line. *Ports of Destination.*

1. American.—New York to Southampton.
2. American.—Philadelphia to Liverpool.
3. Amsinck.—New York to Fayal.[1]
4. Anchor.—New York to Glasgow.
5. Cunard.—New York to Queenstown.
6. Cunard.—Boston to Liverpool.
7. Dominion.—Boston to Liverpool.
8. General Transatlantic.—New York to Havre.
9. Hamburg-American.—New York to Hamburg.
10. Holland-American.—New York to Rotterdam.
11. Italian Royal Mail.—New York to Naples.
12. La Valoce.—New York to Naples.
13. North German Lloyd.—New York to Bremen.
14. Prince.—New York to Punta Delgada.[2]
15. Red Star.—New York to Antwerp.
16. Red Star.—Philadelphia to Antwerp.
17. Thingvalla.—New York to Copenhagen.
18. White Star.—New York to Queenstown.

Canada and Newfoundland.

Name of Line. *Ports of Destination.*

1. Allan.—Philadelphia to St. Johns.
2. Canada, Atlantic and Plant S. S. Co.—Boston to Halifax.
3. Pacific Coast S. S. Co.—San Francisco to Victoria.
4. Red Cross.—New York to St. Johns.

[1] Carries mail to Azores Islands.

[2] Carries mail to Azores Islands.

West Indies, Mexico, Central and South America.

Name of Line. *Port of Destination.*

1. Atlas.—New York to Kingston, Port au Prince, etc.
2. Atlantic and Mexican Gulf S. S. Co.—Mobile to Progresso.
3. Bahama S. S. Co.—New York to Nassau.
4. Cameron.—New York to Port au Prince.
5. Clyde.—New York to San Domingo.
6. Lamport & Holt.—New York to Rio Janeiro.
7. Lamport & Holt.—New York to Buenos Ayres.
8. Mexican International S. S. Co.—San Diego to La Ensenada.
9. Morgan.—New Orleans to Havana.
10. Munson.—New York to Matanzas.
11. New York and Cuba Mail.—New York to Havana.
12. New York and Cuba Mail.—New York to South Cuban Ports.
13. New York and Cuba Mail.—New York to Vera Cruz and Tampico.
14. New York and Porto Rico.—New York to San Juan.
15. Pacific Mail.—San Francisco to Mexican Ports.
16. Pacific Steam Navigation Co.—San Francisco to South American Ports.
17. Panama R. R. Co.'s S. S. Line.—New York to Colon.
18. Prince.—New York to Montevideo.
19. Quebec S. S. Co.—New York to St. Thomas, Barbadoes and Georgetown.
20. Red Cross.—New York to Para and Manaos.
21. Red D.—New York to San Juan and Curaçao.
22. Red D.—New York to Maracaibo.
23. Royal Dutch West Indian Mail.—New York to Port au Prince, Trinidad, Georgetown.
24. South American S. S. Co.—San Francisco, Central and South American Ports.
25. Trinidad.—New York to Grenada and Trinidad.
26. United Fruit Co.—New Orleans to Belize, Port Limon and Belize.
27. United Fruit Co.—Mobile to Bocas del Toro.
28. United Fruit Co.—Philadelphia to Port Antonio.

Transpacific Mail.

Name of Line. *Ports of Destination.*

1. Canadian Pacific S. S. Co.—Victoria to Sydney.
2. Nippon Yusen Kaisha.—Seattle to Yokohama.[1]
3. Northern Pacific S. S. Co.—Tacoma to Yokohama and Hong Kong.[2]
4. Oceanic S. S. Co.—San Francisco to Sydney.
5. Occidental and Oriental S. S. Co.—San Francisco to Shanghai.[3]
6. Oriental S. S. Co.—San Francisco to Hong Kong and Kobe.
7. Pacific Mail.—San Francisco to Shanghai.[4]

Study steamer routes indicated on the Commercial Map of the World. These routes are given in nautical, not statute, miles.

[1] From Yokohama a line runs to Australian ports.
[2] This line carries mail to Hawaii, Tutuila, and Auckland.
[3] Carries mail to Honolulu, Yokohama, and Hong Kong.
[4] Carries mail to Yokohama and Nagasaki.

THE WEATHER BUREAU.

When the English settlement was established at Jamestown, Virginia, the properties of the air had not been revealed to science, and no instrument had been devised to measure its phenomena.

Twenty-three years after the Pilgrims landed on Plymouth Rock, Torricelli brought forth his barometer. His great teacher, Galileo, gave to the world the principle of the thermometer.

One hundred years afterward, our own philosopher, Benjamin Franklin, developed the philosophy of storms. His theory of rotary storms traveling in a northeasterly direction was fully established by the data gathered by Redfield, Espy, Maury, Loomis and Abbe in the early part of the last century.

The first series of weather observations after Franklin were conducted by James Madison and Thomas Jefferson. These observations were begun in 1771. Madison was stationed at Williamsburg, the colonial capital of Virginia, Jefferson at Monticello, 120 miles west of the capital city. These two friends, by comparing observations, found that barometric and thermometric changes usually occurred at Monticello four to five hours before they did at Williamsburg. These two students of nature kept up their study of atmospheric changes through many years.

While in Philadelphia, in July, 1776, Jefferson found time to take several readings each day. On that first memorable Fourth of July Jefferson made the following readings: Thermometer 6 A. M., 68°; 9 A. M., 72¼°; 1 P. M., 76°; 9 P. M., 73½°. This shows that July day to have been a cool one, although most historians affirm otherwise.

A few years after the opening of the Revolutionary War the British ransacked Madison's home, and carried off his barometer.

Prof. Joseph Henry, secretary of the Smithsonian Institution, in 1855 constructed a daily weather map from observations collected by telegraph. With a large wall map he demonstrated the feasibility of establishing a Government weather service. This man's work largely determined the following commercial nations to use this service as an aid to their commerce and various industries: Holland established a weather service with telegraphic reports and forecasts in 1860, England in 1861, France in 1863, and the United States in 1870. To-day most of the nations having an extensive commerce have established a government weather service.

Our own weather service has trained a corps of expert weather forecasters, who present a picture of atmospheric conditions over an area extending from the Atlantic to the Pacific and from the Isthmus of Panama on the south to the northern limit of Canadian settlements. The service presents, every twelve hours, a graphic picture of the hurricanes, cold waves, hot waves, rain- or snow-storms over vast areas. Nowhere else can meteorologists find such an opportunity to study storms and atmospheric changes.

Secretary Wilson, of the Department of Agriculture, has arranged with Europe and the Azores Islands so that meteorological reports of the east Atlantic and adjacent coasts can be received at our Weather Bureau headquarters in Washington. This enables our own Weather Bureau to forecast wind direction and wind force for transatlantic steamers for a period of three days out from each continent. It is estimated that 5628 transatlantic steamers and 5842 transatlantic sailing-vessels enter and leave ports on the Atlantic seaboard each year. Their cargoes are estimated to be worth at least a billion and a half of dollars. Outside of this enumeration is our coast traffic. On the Atlantic coast, from Maine to Florida, in a single year 4000 steamers and 17,000 sailing-vessels clear

port, with cargoes worth seven millions of dollars. Add to these the vast marine interests of the Great Lakes, Gulf and Pacific coast of our nation, and we can in a measure comprehend the value of marine property that our Weather Bureau aims to protect by giving warning of approaching storms.

The service seeks to give warnings from twelve to sixteen hours in advance of a storm, by telegraph, messenger or warning light and flags, directly to the masters of vessels. The Galveston hurricane was detected at the time of its inception, September 1, 1900, in the ocean south of Porto Rico, and such full information of its progress was given out by the Weather Bureau that there was little or no loss of life and property in the Gulf, and when the storm passed over the region of the Great Lakes the warnings had been so general that shipping was kept in port and not a life was lost.

Every day in our ports, float more than forty million dollars' worth of craft. In every port there is stationed either a meteorological observatory or a storm-warning display near, to display danger lights on storm-warning towers by night and danger flags by day, and to distribute storm-warning messages among vessel-masters. From the central office at Washington a storm warning can be dictated, and within an hour this warning will be in the hands of every vessel-master who desires it, in every port of commercial size in our nation.

The benefit of the Weather Bureau to property-owners inland is even greater than to owners of marine property. The cold wave of January 1, 1898, that swept from the Rocky Mountains eastward to the coast, was predicted by the Weather Bureau in sufficient time to save much property. The estimates secured from 100 commercial centers show that property valued at $3,400,000 in these centers was saved as a direct result of these predictions. By means of telegraphic circuits, reports are transmitted with remarkable rapidity.

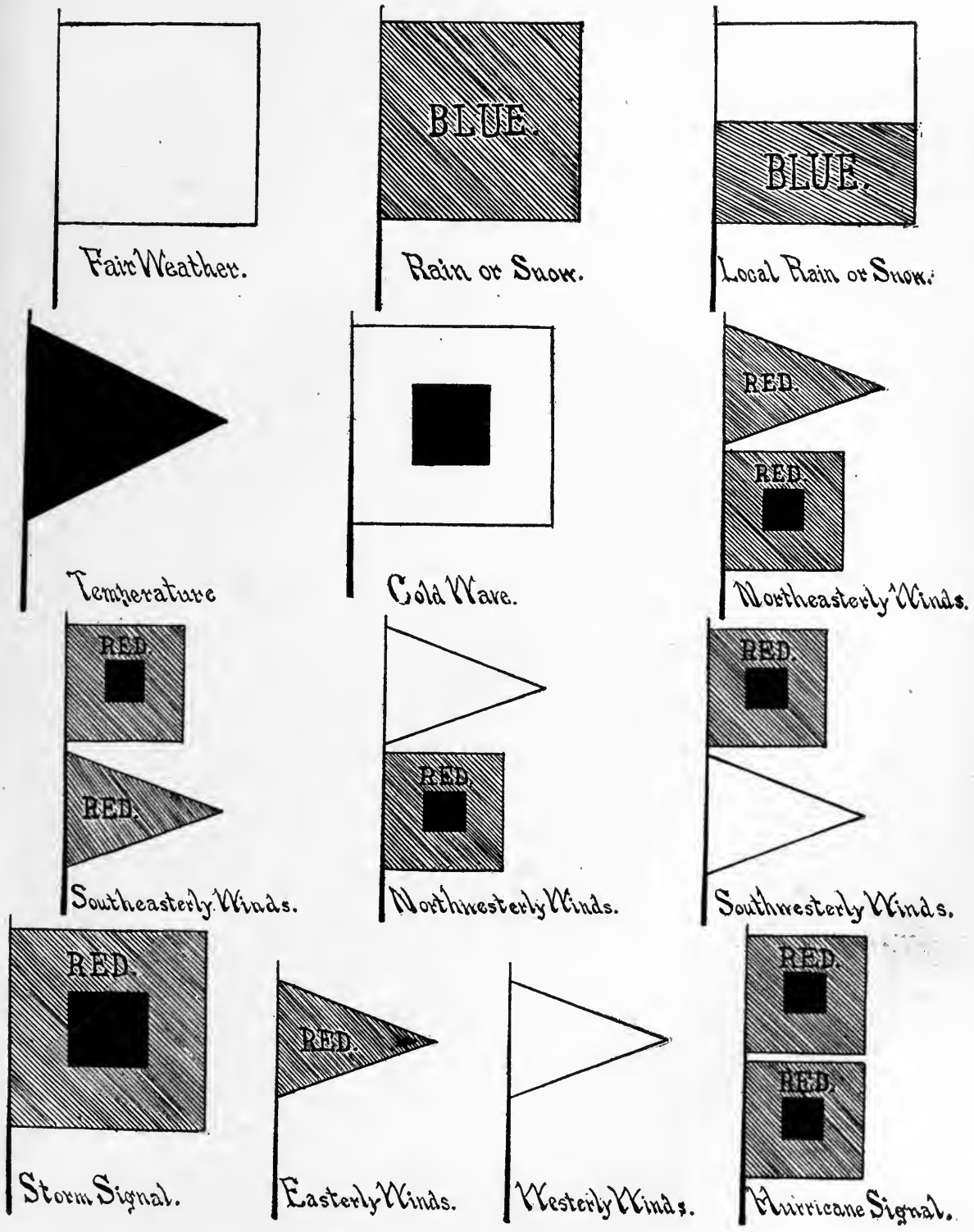
The Bureau has 200 regular meteorological stations, established for geographical advantages in taking observations, each one in charge of a skilled and well-trained observer. This Bureau has 315 paid temperature and rainfall reporters, who daily telegraph their data from all parts of our nation. Besides these, there are 3000 voluntary observers, equipped with standard thermometers and rain-gauges, who daily take weather observations and give weekly crop reports to State central offices; 14,000 other persons report weekly, to the climate and crop centers, the crop conditions in their respective localities. Besides these voluntary workers this Bureau employs 200 skilled employés in the central office at Washington, and 1200 skillfully trained officials in the field.

The machinery of reports has been so perfected that within thirty minutes after the station observer in the most remote telegraph circuit has filed his observation, all observations have been received at the central office.

Synoptic charts are made from the daily readings made at 8 A. M. and 8 P. M. (75th meridian time). These observations consist of readings of the barometer, thermometer, direction and velocity of the wind, state of the weather, amount, kind and direction of clouds, and amount of rain or snow.

The weather maps are made at Washington, Toronto (Canada), and many of the larger stations selected for their location, as Kansas City, Denver, and San Francisco. Solid lines, called isobars, pass through points in the weather map having the same atmospheric pressure. Dotted lines, called isotherms, pass through points having the same temperature. These lines are drawn for every ten degrees. Heavy dotted lines are sometimes shown inclosing areas where a decided change in temperature has occurred within the last twenty-four hours.

The general movement of storms in the United States is from west to east, similar to a series of atmospheric waves. The crests are designated in the weather maps as "highs" and the depressions or troughs as "lows." These alternating highs



United States Weather and Storm Signal Flags.

and lows have an average easterly movement of 600 miles per day. An absence of decided waves of high or of low pressure indicates a continuance of existing weather, which will last till later maps show a change, usually first appearing in the west.

Symbols indicate the state of the weather as the accompanying map shows. These maps are sent to every postoffice every day, and to 2000 weekly, 434 semi-weekly, 14,734 papers in the land. All schools and private citizens who desire these maps can obtain them free of charge upon application.

The efficiency of the flood-warning branch of the Weather Bureau Service is comprehended by the following incident: During the time of the flood of 1897 the warnings sent out enabled owners to save fifteen millions of dollars' worth of live stock and movable property: The flood-warning service has fifteen river centers, with a special Texas district that is now being added.

The rural delivery of the Postal Department has enabled the Weather Bureau to place its daily forecasts in the hands of thousands of agriculturists. The latest forecast is printed on slips of paper, and each rural carrier provided with enough to supply each house on his route.

The Weather Bureau costs our Government at the present time one million dollars annually. Conservative experts estimate that this Weather Bureau service is worth fully twenty million dollars to the agricultural, commercial and general industrial interests of the United States. As forecasters study the physical laws governing atmospheric changes, their predictions become more accurate and render the service still more efficient. For this reason the merit system prevails in the employment and retention of employés in this service. Most of the forecasters at the present time are skilled meteorologists, with twenty years of experience in the field.

STANDARD TIME.

What is known as "Standard Time" was adopted by all the principal railroads of the United States at 12 o'clock, noon, on November 18, 1883. The system divides the nation into five longitudinal belts, and fixes a meridian of time for each belt. These meridians are fifteen degrees of longitude apart. Eastern Maine, New Brunswick and Nova Scotia use the 60th meridian; Quebec, Ontario, New England, the Middle States, Virginia and the Carolinas use the 75th meridian, which is that of Philadelphia; the States of the Mississippi Valley, Alabama, Georgia and Florida, and westward, including Texas, Kansas, and the larger part of Nebraska and Dakota, use the 90th meridian, which is that of St. Louis. The Territories to the western border of Arizona and Montana go by the time of the 105th meridian, which is that of Denver; and the Pacific States use the 120th meridian to mark Pacific. The time between the various meridians is known as Intercolonial, Eastern, Central, Mountain and Pacific time, respectively. Fifteen degrees equal one hour of time, and the standard meridians control the time for seven and one-half degrees in each direction. The traveler then makes an hour's change in his watch just half-way between each meridian, turning forward if traveling east and backward if traveling west across the continent.

Professor Abbe, of the U. S. Signal Bureau, demonstrated the practical value of this system of reckoning time, and was the first one to urge its adoption.

International Date Line.

Explained on Page 103, Part II.

THE COINS OF COMMERCIAL REALMS.

Money is a medium of exchange, and as such is the commercial standard of values. The kind of money used by different countries is an index to their civilization.

The following stages show the development of commercial units of value:

I. Pastoral Stage.

Sheep and Cattle.—This goes back to patriarchal times, when a man's wealth was estimated by his flocks and herds. The words, *fee, pecuniary, capital,* in the English, and similar words in nearly every other general language, testify to the early and universal use of sheep and cattle as money.

II. Hunting and Fishing Stage.

1. Beaver-skins.
2. Fish-hooks.
3. Wampum.

The first became a unit of value when Europeans traded with Indians in "trapping" days, and the third was official money between Indians and white settlers of New England and New Amsterdam for many decades. Wampum consists of white beads made from a periwinkle-shell, or black beads cut from clam-shells, arranged in strings or belts. When the shrewd Yankee began imitating with glass or wooden beads, wampum lost its intrinsic worth as money. Shells are still used as money on some tropical coasts.

Fish-hooks for many decades formed the coin of trade on the northern shores of the Indian ocean. Now, from Persia to Ceylon, the native fisher-women count their wealth by pieces of bent wire used as hooks.

III. The Agricultural Stage.

1. Dried Codfish.
2. Cereals.
3. Tobacco.

For some time in early days of colonization dried codfish was the unit of barter in Newfoundland. For more than twenty centuries, wheat, oats and barley have been standard measures of value in remote northern regions of Europe. Maize or Indian corn was once the currency of Mexico and Central America, as well as of some of the English colonies of North America. Tobacco passed current in Virginia in colonial days, and was legal tender in Maryland as late as 1732.

IV. Manufacturing Stage.

1. Chinese Hoe.
2. Hand-made Nails.

In remote times the hoe was a standard unit of value in China, and later gave place to miniature hoes that became true money. A similar unit is in use to-day in Anam.

Some Scotch villages in the Middle Ages used hand-made nails to measure values.

V. Commercial Stage.

1. Bronze pieces.
2. Blacksmith Iron.
3. Chinese "Cash."
4. Copper Coin.

The bronze bars and stamped bronze pieces were coins used in Greece and Italy in ancient times, and mark the transition from cattle money to stamped metallic money.

Iron was used in Sparta and other parts of the ancient world, and iron ready for the blacksmith is now used in various places on the West-African coast.

The Chinese have for their native coin and principal legal tender round disks of brass with a square hole in the center. This "cash" is used in all small accounts, and is also called "sapeks" or "le."

The copper or brass coin known as the "as" was used in Italy until 200, A. D.

VI. International Trade.

1. Silver.
2. Gold.
3. Copper.

Real coinage began when governments guaranteed weight and fineness with a government official stamp. One of the earliest silver coins was a Romano-Campanian coin, struck off at Rome, about 300 B. C.

Gold was first coined at Rome, about 206 B. C.

The florin, minted at Florence in the fourteenth century (A. D.) was the first regular coin of trade in western Europe. The English pound sterling has now become the recognized unit of value in commerce for international trade.

The following table gives the standard money of the principal commercial countries according to the official valuations received at the United States Treasury.

VALUE OF FOREIGN COINS AND CURRENCIES.

(From United States consular reports.)

Countries.	*Standard.*	*Monetary Unit.*	*Value in U. S. Gold.*
Argentine Republic	Gold and silver,	Peso	$0.965
Austria	Gold	Crown	.203
Belgium	Gold and silver,	Franc	.193
Brazil	Gold	Milreis	.546
British North America *	Gold	Dollar	1.00
British Honduras	Gold	Dollar	1.00
Chile	Gold	Peso	.365
Costa Rica	Gold	Colon	.465
Cuba	Gold and silver,	Peso	.926
Denmark	Gold	Crown	.268
Ecuador	Gold	Sucre	.487
Egypt	Gold	Pound (100 piasters)	4.943
Finland	Gold	Mark	.193
France	Gold and silver,	Franc	.193
Germany	Gold	Mark	.238
Great Britain	Gold	Pound sterling	4.866½
Greece	Gold and silver,	Drachma	.193
Haiti	Gold and silver,	Gourde	.963

*Except Newfoundland.

VALUE OF FOREIGN COINS AND CURRENCIES.—Continued.

Countries.	*Standard.*	*Monetary Unit.*	*Value in U. S. Gold.*
India	Gold	Rupee	.324
Italy	Gold and silver,	Lira	.193
Japan	Gold	Yen	.498
Liberia	Gold	Dollar	1.00
Netherlands	Gold and silver,	Florin	.402
Newfoundland	Gold	Dollar	1.014
Peru	Gold	Sol	.487
Portugal	Gold	Milreis	1.08
Russia	Gold	Ruble	.515
Spain	Gold and silver.	Peseta	.193
Sweden and Norway	Gold	Crown	.268
Switzerland	Gold and silver,	Franc	.193
Turkey	Gold	Piaster	.044
Uruguay	Gold	Peso	1.034
Venezuela	Gold and silver,	Bolivar	.193

COUNTRIES WITH FLUCTUATING CURRENCIES.

Countries.	*Standard.*	*Monetary Unit.*	*Value Jan. 1, 1901, in U. S. Gold.*
Bolivia	Silver	Boliviano	$0.468
Central America	Silver	Peso	.465
China	Silver	Haikwantael	.771
Colombia	Silver	Peso	.468
Mexico	Silver	Dollar	.509
Persia	Silver	Kran	.086

The money coinage of the world for the year 1900, the Director of the United States Mint gives as follows:

Gold (in U. S. dollars), $355,000,000.

Silver (in U. S. dollars), $177,000,000.

U. S. coinage: gold, $99,000,000; silver, $30,350,000; minor coins, $1,482,000.

The money of the United States consists of gold coin, standard silver dollars, subsidiary silver, nickel coins, gold certificates, silver certificates, Treasury notes (act of July 14, 1890), U. S. notes, currency certificates (act of June 8, 1872), and National Bank notes.

The monetary unit of our nation is the dollar.

THE FIVES OF COMMERCE.

Here are given the most important commercial nations or countries of each of the grand divisions. Items under *A* indicate the five most important exports, under *B*, the five most important imports, and nations named under *C* indicate the national counters at which the most of this nation's trading is done.

I. Europe.

	A.	*B.*	*C.*
AUSTRIA—	1. Sugar.	1. Cotton and wool fibers.	1. Germany.
	2. Timber and wood.	2. Yarn.	2. Great Britain.
	3. Live animals.	3. Cloth.	3. Italy.
	4. Cereals.	4. Coffee.	4. United States.
	5. Leather goods.	5. Wheat products.	5. Switzerland.
BELGIUM*—	1. Yarns (linen, wool, etc.).	1. Cereals.	1. France.
	2. Coal, coke, etc.	2. Textile fibers.	2. Great Britain.
	3. Machinery.	3. Chemicals and drugs.	3. Holland.
	4. Textile fabrics.	4. Timbers and resins.	4. United States.
	5. Glass.	5. Animal products.	5. Germany.
DENMARK—	1. Butter.	1. Cereals.	1. Sweden.
	2. Eggs.	2. Textile fabrics.	2. Russia.
	3. Meats.	3. Machinery.	3. United States.
	4. Live animals.	4. Wood and timber.	4. Great Britain.
	5. Colonial goods.	5. Coal.	5. Germany.
FRANCE—	1. Textile fabrics.	1. Cereals.	1. Great Britain.
	2. Wine.	2. Raw wool, silk, and cotton.	2. Belgium.
	3. Alimentary pastes (macaroni, vermicelli, etc.).	3. Timber and wood.	3. Germany.
		4. Coal, coke, etc.	4. United States.
	4. Sugar.	5. Coffee.	5. Algeria.
	5. Leather goods.		
GERMANY—	1. Iron and steel manufactures.	1. Breadstuffs.	1. Great Britain.
	2. Textile fabrics.	2. Potatoes.	2. United States.
	3. Metal, wooden, leather, and paper wares.	3. Textile fibers.	3. Austria.
		4. Petroleum.	4. Russia.
	4. Chemicals and drugs.	5. Animal products.	5. France.
	5. Stone, clay, and glassware.		
GREAT BRITAIN—	1. Textile fabrics.	1. Breadstuffs.	1. United States.
	2. Iron and steel manufactures.	2. Textile fibers.	2. France.
	3. Coal, coke, etc.	3. Animal products.	3. India.
	4. Chemicals.	4. Wood and timber.	4. Germany.
	5. Copper.	5. Butter and oleomargarine.	5. Australasia.
GREECE—	1. Currants (dried).	1. Cereals.	1. Great Britain.
	2. Ores.	2. Textile fabrics.	2. Russia.
	3. Olive oil.	3. Coal.	3. Austria.
	4. Wines.	4. Wood and timber.	4. France.
	5. Figs.	5. Live stock.	5. Turkey and Egypt.
ITALY—	1. Raw silk and silk goods.	1. Wheat.	1. Great Britain.
	2. Wine.	2. Raw cotton and wool.	2. Germany.
	3. Olive oil.	3. Coal.	3. France.
	4. Sulphur.	4. Machinery.	4. Austria.
	5. Eggs.	5. Lumber.	5. Switzerland.
NETHER-LANDS—	1. Butter and cheese.	1. Cereals and flour.	1. Prussia.
	2. Vegetables.	2. Lumber.	2. Great Britain.
	3. Sugar.	3. Iron and steel manufactures.	3. Belgium.
	4. Drugs.	4. Textile fibers.	4. Java.
	5. Fish.	5. East India fruits and spices.	5. United States.

*Belgium supplies most of the world with its ivory.

I. Europe.—*Continued.*

	A.	*B.*	*C.*
PORTUGAL—	1. Wine.	1. Wheat.	1. Great Britain.
	2. Cork.	2. Textile fibers and fabrics.	2. Germany.
	3. Fish.	3. Sugar.	3. United States.
	4. Copper.	4. Coal.	4. Brazil.
	5. Subtropical fruits.	5. Iron.	5. Spain.
RUSSIA—	1. Wheat and flour.	1. Textile fibers.	1. Germany.
	2. Timber and wooden goods.	2. Machinery.	2. Great Britain.
	3. Flax fiber.	3. Tea.	3. France.
	4. Leather goods and furs.	4. Coal, coke, etc.	4. Holland.
	5. Dairy produce and eggs.	5. Chemicals.	5. Austria.
SPAIN—	1. Wine.	1. Cotton and cotton manufactures.	1. France.
	2. Cork.		2. Great Britain.
	3. Oranges, olives and olive oil.	2. Machinery.	3. United States.
	4. Minerals.	3. Live animals and meats.	4. Portugal.
	5. Raw silk.	4. Timber and wood.	5. Germany.
		5. Woolen and silk goods.	
SWEDEN AND NORWAY—	1. Lumber and wood manufactures.*	1. Breadstuffs.	1. Great Britain.
	2. Fish.	2. Textile fibers and fabrics.	2. Germany.
	3. Swedish ores.	3. Machinery.	3. Denmark.
	4. Animal products (malty food).	4. Metals.	4. Russia.
	5. Paper and paper manufactures.	5. Vegetable products.	5. France.
SWITZERLAND—	1. Silk and cotton fabrics.	1. Breadstuffs.	1. Great Britain.
	2. Clocks and watches.	2. Raw silk and cotton.	2. Germany.
	3. Colors.	3. Metals and mineral substances.	3. Denmark.
	4. Machinery.		4. Russia.
	5. Condensed milk.	4. Coal, coke, etc.	5. France.
		5. Leather and leather goods.	
TURKEY—	1. Wine.	1. Textile fabrics.	1. Great Britain.
	2. Fruits.	2. Sugar.	2. Austria.
	3. Rugs and carpets.	3. Breadstuffs.	3. France.
	4. Tobacco.	4. Coffee.	4. Russia.
	5. Sponges and pearls.	5. Petroleum.	5. Italy.

* Sweden is the largest lumber-exporting country in Europe. It is also a match factory for the world.

II. North America.

	A.	*B.*	*C.*
UNITED STATES—	1. Breadstuffs.	1. Sugar.	1. Great Britain.
	2. Cotton.	2. Hides and skins.	2. Germany.
	3. Meat and dairy products.	3. Chemicals, drugs and dyes.	3. France.
	4. Iron and steel manufactures.	4. Coffee.	4. Canada.
	5. Petroleum.	5. Raw silk.	5. Netherlands.
CANADA—	1. Wood and manufactures.	1. Iron and steel manufactures.	1. Great Britain.
	2. Wheat and flour.	2. Coal and coke.	2. United States.
	3. Cheese.	3. Woolen goods.	3. Germany.
	4. Fish.	4. Sugar.	4. France.
	5. Gold.	5. Cottons.	5. West Indies.
REPUBLICS OF CENTRAL AMERICA—	1. Coffee.	1. Cotton goods.	1. Great Britain.
	2. Bananas.	2. Hardware.	2. United States.
	3. Hides and skins.	3. Flour.	3. Germany.
	4. Cedar and dyewoods.	4. General manufactures.	4. France.
	5. Caoutchouc.	5. Tinware.	5. Mexico.

(Complete commercial statistics for Central American republics are not available.)

II. North America.—*Continued.*

	A.	*B.*	*C.*
MEXICO—	1. Silver. 2. Coffee. 3. Sisal hemp. 4. Gold. 5. Cattle.	1. Linen, woolen and cotton fabrics. 2. Hardware. 3. Machinery.	1. United States. 2. Great Britain. 3. France. 4. Germany. 5. Spain.
CUBA—	1. Sugar. 2. Tobacco. 3. Honey and wax. 4. Hides. 5. Rum.	1. Flour. 2. Rice. 3. Meats and lard. 4. Coal. 5. Kerosene.	1. United States. 2. Great Britain. 3. Spain. 4. France. 5. Belgium.
WEST INDIES—	1. Coffee. 2. Sugar. 3. Rum. 4. Cacao. 5. Cocoanuts.	1. Cotton fabrics. 2. Codfish. 3. Flour. 4. Rice. 5. Kerosene.	1. United States. 2. Great Britain. 3. Cuba. 4. France. 5. Denmark.

[Bermuda onions and asphalt from Trinidad are very important exports.]

III. South America.

	A.	*B.*	*C.*
ARGENTINE REPUBLIC—	1. Wool. 2. Meats.* 3. Live stock. 4. Hides and horns. 5. Wheat.	1. Textile fabrics. 2. Iron and steel manufactures. 3. Breadstuffs. 4. Crockery and glass. 5. Beverages.	1. Great Britain. 2. France. 3. Germany. 4. Belgium. 5. United States.
COLOMBIA—	1. Coffee. 2. Timber. 3. Vegetables. 4. Tobacco. 5. Hides and cattle.	1. Foodstuffs. 2. Iron and steel manufactures. 3. Textile fabrics. 4. Beverages. 5. Kerosene.	1. United States. 2. Great Britain. 3. Germany. 4. France. 5. West Indies.
BOLIVIA—	1. Silver. 2. Tin and bismuth. 3. Copper. 4. Rubber. 5. Quina.	1. Breadstuffs. 2. Iron and steel manufactures. 3. Beverages. 4. Textile fabrics. 5. Ready-made clothing.	Has no seaport, and carries on its foreign trade through Chile, Argentine, Brazil, and Peru. Great Britain, Germany and United States furnish most of the imports purchased by Bolivia, that are not furnished by the above-named republics.
BRAZIL—	1. Coffee. 2. Rubber. 3. Tobacco. 4. Hides. 5. Cacao.	1. Breadstuffs. 2. Meats. 3. Coal. 4. Machinery. 5. Textile fabrics.	1. United States. 2. France. 3. Great Britain. 4. Germany. 5. Belgium.

[Until 1867 Brazil was the chief source of the world's diamonds. Since that date her diamonds have largely been supplanted by the Kimberley Diamonds of South Africa.]

CHILE—	1. Nitrate. 2. Copper. 3. Wheat. 4. Gold. 5. Beans.	1. Textile fabrics. 2. Cattle. 3. Machinery. 4. Oil. 5. Tea.	1. Great Britain. 2. Germany. 3. United States. 4. France. 5. Peru.
ECUADOR—	1. Cacao. 2. Coffee. 3. Rubber. 4. Hides. 5. Vegetable ivory.	1. Breadstuffs. 2. Textile fabrics. 3. Machinery. 4. Kerosene. 5. Lard.	1. France. 2. Great Britain. 3. United States. 4. Spain. 5. Peru.

*The world's largest frozen-meat plant is located at Buenos Aires.

I. Europe.—*Continued.*

	A.	*B.*	*C.*
PORTUGAL—	1. Wine.	1. Wheat.	1. Great Britain.
	2. Cork.	2. Textile fibers and fabrics.	2. Germany.
	3. Fish.	3. Sugar.	3. United States.
	4. Copper.	4. Coal.	4. Brazil.
	5. Subtropical fruits.	5. Iron.	5. Spain.
RUSSIA—	1. Wheat and flour.	1. Textile fibers.	1. Germany.
	2. Timber and wooden goods.	2. Machinery.	2. Great Britain.
	3. Flax fiber.	3. Tea.	3. France.
	4. Leather goods and furs.	4. Coal, coke, etc.	4. Holland.
	5. Dairy produce and eggs.	5. Chemicals.	5. Austria.
SPAIN—	1. Wine.	1. Cotton and cotton manufactures.	1. France.
	2. Cork.		2. Great Britain.
	3. Oranges, olives and olive oil.	2. Machinery.	3. United States.
	4. Minerals.	3. Live animals and meats.	4. Portugal.
	5. Raw silk.	4. Timber and wood.	5. Germany.
		5. Woolen and silk goods.	
SWEDEN AND NORWAY—	1. Lumber and wood manufactures.*	1. Breadstuffs.	1. Great Britain.
	2. Fish.	2. Textile fibers and fabrics.	2. Germany.
	3. Swedish ores.	3. Machinery.	3. Denmark.
	4. Animal products (malty food).	4. Metals.	4. Russia.
	5. Paper and paper manufactures.	5. Vegetable products.	5. France.
SWITZERLAND—	1. Silk and cotton fabrics.	1. Breadstuffs.	1. Great Britain.
	2. Clocks and watches.	2. Raw silk and cotton.	2. Germany.
	3. Colors.	3. Metals and mineral substances.	3. Denmark.
	4. Machinery.		4. Russia.
	5. Condensed milk.	4. Coal, coke, etc.	5. France.
		5. Leather and leather goods.	
TURKEY—	1. Wine.	1. Textile fabrics.	1. Great Britain.
	2. Fruits.	2. Sugar.	2. Austria.
	3. Rugs and carpets.	3. Breadstuffs.	3. France.
	4. Tobacco.	4. Coffee.	4. Russia.
	5. Sponges and pearls.	5. Petroleum.	5. Italy.

*Sweden is the largest lumber-exporting country in Europe. It is also a match factory for the world.

II. North America.

	A.	*B.*	*C.*
UNITED STATES—	1. Breadstuffs.	1. Sugar.	1. Great Britain.
	2. Cotton.	2. Hides and skins.	2. Germany.
	3. Meat and dairy products.	3. Chemicals, drugs and dyes.	3. France.
	4. Iron and steel manufactures.	4. Coffee.	4. Canada.
	5. Petroleum.	5. Raw silk.	5. Netherlands.
CANADA—	1. Wood and manufactures.	1. Iron and steel manufactures.	1. Great Britain.
	2. Wheat and flour.	2. Coal and coke.	2. United States.
	3. Cheese.	3. Woolen goods.	3. Germany.
	4. Fish.	4. Sugar.	4. France.
	5. Gold.	5. Cottons.	5. West Indies.
REPUBLICS OF CENTRAL AMERICA—	1. Coffee.	1. Cotton goods.	1. Great Britain.
	2. Bananas.	2. Hardware.	2. United States.
	3. Hides and skins.	3. Flour.	3. Germany.
	4. Cedar and dyewoods.	4. General manufactures.	4. France.
	5. Caoutchouc.	5. Tinware.	5. Mexico.

(Complete commercial statistics for Central American republics are not available.)

II. North America.—*Continued.*

	A.	*B.*	*C.*
MEXICO—	1. Silver. 2. Coffee. 3. Sisal hemp. 4. Gold. 5. Cattle.	1. Linen, woolen and cotton fabrics. 2. Hardware. 3. Machinery.	1. United States. 2. Great Britain. 3. France. 4. Germany. 5. Spain.
CUBA—	1. Sugar. 2. Tobacco. 3. Honey and wax. 4. Hides. 5. Rum.	1. Flour. 2. Rice. 3. Meats and lard. 4. Coal. 5. Kerosene.	1. United States. 2. Great Britain. 3. Spain. 4. France. 5. Belgium.
WEST INDIES—	1. Coffee. 2. Sugar. 3. Rum. 4. Cacao. 5. Cocoanuts.	1. Cotton fabrics. 2. Codfish. 3. Flour. 4. Rice. 5. Kerosene.	1. United States. 2. Great Britain. 3. Cuba. 4. France. 5. Denmark.

[Bermuda onions and asphalt from Trinidad are very important exports.]

III. South America.

	A.	*B.*	*C.*
ARGENTINE REPUBLIC—	1. Wool. 2. Meats.* 3. Live stock. 4. Hides and horns. 5. Wheat.	1. Textile fabrics. 2. Iron and steel manufactures. 3. Breadstuffs. 4. Crockery and glass. 5. Beverages.	1. Great Britain. 2. France. 3. Germany. 4. Belgium. 5. United States.
COLOMBIA—	1. Coffee. 2. Timber. 3. Vegetables. 4. Tobacco. 5. Hides and cattle.	1. Foodstuffs. 2. Iron and steel manufactures. 3. Textile fabrics. 4. Beverages. 5. Kerosene.	1. United States. 2. Great Britain. 3. Germany. 4. France. 5. West Indies.
BOLIVIA—	1. Silver. 2. Tin and bismuth. 3. Copper. 4. Rubber. 5. Quina.	1. Breadstuffs. 2. Iron and steel manufactures. 3. Beverages. 4. Textile fabrics. 5. Ready-made clothing.	Has no seaport, and carries on its foreign trade through Chile, Argentine, Brazil, and Peru. Great Britain, Germany and United States furnish most of the imports purchased by Bolivia, that are not furnished by the above-named republics.
BRAZIL—	1. Coffee. 2. Rubber. 3. Tobacco. 4. Hides. 5. Cacao.	1. Breadstuffs. 2. Meats. 3. Coal. 4. Machinery. 5. Textile fabrics.	1. United States. 2. France. 3. Great Britain. 4. Germany. 5. Belgium.

[Until 1867 Brazil was the chief source of the world's diamonds. Since that date her diamonds have largely been supplanted by the Kimberley Diamonds of South Africa.]

CHILE—	1. Nitrate. 2. Copper. 3. Wheat. 4. Gold. 5. Beans.	1. Textile fabrics. 2. Cattle. 3. Machinery. 4. Oil. 5. Tea.	1. Great Britain. 2. Germany. 3. United States. 4. France. 5. Perú.
ECUADOR—	1. Cacao. 2. Coffee. 3. Rubber. 4. Hides. 5. Vegetable ivory.	1. Breadstuffs. 2. Textile fabrics. 3. Machinery. 4. Kerosene. 5. Lard.	1. France. 2. Great Britain. 3. United States. 4. Spain. 5. Peru.

*The world's largest frozen-meat plant is located at Buenos Aires.

III. South America.—*Continued.*

	A.	*B.*	*C.*
GUIANA—	1. Sugar.	1. Flour.	1. Great Britain.
	2. Rubber.	2. Textile fabrics.	2. United States.
	3. Molasses.	3. Coal.	3. Netherlands.
	4. Rum.	4. Meats (dried).	4. France.
	5. Gold.	5. Hardware.	5. West Indies.
	[From French Guiana is obtained cayenne pepper.]		
PARAGUAY—	1. Yerba maté.	1. Textile fabrics.	1. Argentine.
	2. Hides.	2. Wine.	2. Uruguay.
	3. Timber.	3. Rice.	3. Great Britain.
	4. Tobacco.	4. Wheat.	4. Brazil.
	5. Oranges.	5. Hardware.	
PERU—	1. Silver.	1. Textile fabrics.	1. Great Britain.
	2. Copper.	2. Machinery.	2. Germany.
	3. Sugar.	3. Hardware.	3. United States.
	4. Cotton.	4. Breadstuffs.	4. Chile.
	5. Hides.	5. Lumber.	5. France.
	[Cinchona bark is an important export.]		
URUGUAY—	1. Jerked beef.	1. Foodstuffs.	1. Argentine.
	2. Wool.	2. Beverages.	2. Great Britain.
	3. Horns and bone ash.	3. Textile fabrics.	3. France.
	4. Frozen meats.	4. Machinery.	4. Brazil.
	5. Flax.	5. Coal.	5. Belgium.
VENEZUELA—	1. Coffee.	1. Breadstuffs.	1. United States.
	2. Cacao.	2. Textile fabrics.	2. Great Britain.
	3. Hides and skins.	3. Machinery.	3. Germany.
	4. Rubber.	4. Coal.	4. France.
	5. Gold.	5. Kerosene.	5. Cuba.

IV. Africa.

	A.	*B.*	*C.*
ALGERIA—	1. Vegetables.	1. Cattle.	1. France.
	2. Wines.	2. Timber.	2. Great Britain.
	3. Dates.	3. Coal.	3. Morocco.
	4. Cereals.	4. Machinery.	4. Tunis.
	5. Tobacco.	5. Coffee.	5. Russia.
ABYSSINIA—	1. Coffee.	1. Textile fabrics.	1. Egypt.
	2. Civet.	2. French mirrors and cutlery.	2. Great Britain.
	3. Wax.	3. Matches.	3. India.
	4. Gold.	4. Firearms.	4. France.
	5. Ivory.	5. Spirits.	
CAPE COLONY—	1. Gold.	1. Textile fabrics.	1. Great Britain.
	2. Diamonds.	2. Breadstuffs.	Nearly all exports go to Great Britain, and a large portion of imports come from that country. The United States, India, Germany and France furnish most of the remaining imports.
	3. Ostrich feathers.	3. Machinery.	
	4. Wool.	4. Lumber.	
	5. Hides.	5. Naval stores.	
EGYPT—	1. Cotton.	1. Cotton fabrics.	1. Great Britain.
	2. Cereals.	2. Coal.	2. France and Algeria.
	3. Tobacco.	3. Petroleum.	3. Russia.
	4. Beans.	4. Machinery.	4. United States.
	5. Dates.		5. Germany.
KONGO INDEPENDENT STATE—	1. Rubber.	1. Textile fabrics.	1. Belgium.
	2. Ivory.	2. Foodstuffs.	2. Great Britain.
	3. Palm nuts.	3. Machinery.	3. Neighboring possessions.
	4. Palm oil.	4. Beverages.	4. Germany.
	5. Coffee.	5. Steamers.	5. Netherlands.

IV. Africa.—*Continued.*

	A.	*B.*	*C.*
MADAGASCAR—	1. Rubber.	1. Cotton textiles.	1. France.
	2. Wax.	2. Beverages.	2. Great Britain.
	3. Hides.	3. Flour.	3. Germany.
	4. Gold.	4. Tobacco.	4. Neighboring possessions.
	5. Vanilla.	5. Machinery.	
MOROCCO—	1. Goat-skins.	1. Sugar.	1. Great Britain.
	2. Cattle.	2. Tea.	2. France.
	3. Wool.	3. Hardware.	3. Germany.
	4. Eggs.	4. Candles.	4. Spain.
	5. Beans.	5. Petroleum.	5. Rest of Barbary states.
NATAL—	1. Wool.	1. Textile fabrics.	1. Great Britain.
	2. Hides and skins.	2. Iron and steel manufactures.	2. Cape Colony.
	3. Coal.	3. Breadstuffs.	
	4. Gold.	4. Machinery.	
	5. Bark.	5. Leather goods.	
ORANGE FREE STATE—	1. Animal products.	1. General merchandise.	1. Cape Colony.
	2. Diamonds.	2. Cereals.	2. Natal.
	3. Garnets.	3. Wool.	3. Basutoland.
	4. Coal.	4. Horses.	4. South African Republic.
SOUTH AFRICAN REPUBLIC—	1. Gold.	1. Machinery.	1. Cape Colony.
	2. Wool.	2. Textile fabrics.	2. Great Britain.
	3. Cattle and hides.	3. Hardware.	3. Rest of Europe.
	4. Ostrich feathers.	4. Leather goods.	4. Natal.
	5. Ivory.	5. Timber.	5. Orange Free State.

[Now in state of war with Great Britain — nation in control. Therefore no late data on commerce. Data for 1897.]

TRIPOLI—	1. Esparto (a grass fiber).	1. Textiles.	1. The Sudan Country.
	2. Sponges.	2. General manufactures.*	2. Great Britain.
	3. Barley.	3. Glassware.	3. France.
	4. Madder.	4. Sugar.	4. Germany.
	5. Henna leaves.		5. Italy.
TUNIS—	1. Wheat.	1. Textiles.	1. France.
	2. Olive oil.	2. Foodstuffs.	2. Great Britain.
	3. Zinc.	3. Sugar.	3. Italy.
	4. Alfa (grass fiber).	4. Machinery.	4. Algeria.
	5. Wine.	5. Railroad materials.	5. Russia.

[Dates of the oases are the best in the commercial world.]

*Tripoli carries on a large caravan trade with the Sudan, and many of these articles are for the Sudanese trade.

V. Asia.

	A.	*B.*	*C.*
ARABIA—	1. Mocha coffee.	1. Cotton fabrics.	1. Great Britain.
	2. Ivory.	2. General manufactures.	2. United States.
	3. Sheep and goat skins.		3. India.
	4. Gum arabic and myrrh.		4. Egypt.
	5. Pearls.		5. Zanzibar.
AFGHANISTAN—	1. Cotton goods.	1. Machinery.	1. India.
	2. Fruits and vegetables.	2. Firearms and ammunition.	2. Persia.
	3. Cereals (barley, wheat, rice, corn).	3. General manufactures.	3. China.
	4. Felts and carpets.		4. Great Britain.
	5. Drugs (crude).		5. Russia.
CHINA—	1. Silk.	1. Cotton fabrics.	1. Hong Kong.
	2. Tea.	2. Opium.	2. Great Britain.
	3. Hides.	3. Kerosene.	3. Japan.
	4. Matting and straw braid.	4. Metals.	4. United States.
	5. Chinaware and pottery.	5. Coal.	5. India.

V. Asia.—*Continued.*

	A.	*B.*	*C.*
INDIA—	1. Cotton.	1. Cotton fabrics.	1. Great Brtain.
	2. Rice.	2. Metals and hardware.	2. China.
	3. Jute.	3. Machinery.	3. France.
	4. Wheat.	4. Sugar.	4. Straits Settlements.
	5. Oil seeds.	5. Oils.	5. Belgium.
	[Opium is a large export.]		
JAPAN—	1. Raw silk and silk textiles.	1. Raw cotton.	1. United States.
	2. Cotton yarns.	2. Rice.	2. Netherlands.
	3. Coal.	3. Sugar.	3. China.
	4. Tea.	4. Cotton textiles.	4. Italy.
	5. Copper.	5. Kerosene.	5. Great Britain.
	[Japan, through Formosa, is the chief source of camphor gum.]		
PERSIA—	1. Opium.	1. Textile fabrics.	1. India.
	2. Pearls.	2. Glass.	2. Russia.
	3. Dried fruits.	3. Carriages.	3. Great Britain.
	4. Textile fibers (cotton, wool, silk).	4. Sugar.	4. France.
		5. Petroleum.	5. Germany.
	5. Carpets.		

[The world's greatest pearl center is near the Bahrein Islands, Persian Gulf, and the richest turquoises in the market come from the Persian mines situated at Nishapur.]

RUSSIAN ASIA—	1. Cotton.	1. Breadstuffs.	1. Russia.
	2. Petroleum.	2. Farm implements.	2. Japan.
	3. Wheat.	3. Iron and steel manufactures.	3. United States.
	4. Furs.	4. Textile manufactures.	4. Korea.
	5. Gold.	5. Railroad supplies.	5. Persia.

[The Trans-Siberian Railroad, now open via the Manchurian branch, is one of the greatest feats of engineering skill. It will be a great factor in developing commerce in Russian Asia.]

VI. Australasia.

	A.	*B.*	*C.*
AUSTRALIA—	1. Wool.	1. Textile fabrics.	1. Great Britain.
	2. Frozen and preserved meats.	2. Hardware and machinery.	2. New Zealand and the rest of Australasia.
	3. Gold.	3. Coffee and tea.	
	4. Hides and skins.	4. Sugar.	3. Germany.
	5. Dairy products.	5. Petroleum.	4. France.
			5. United States.
EAST INDIES—	1. Sugar.	1. Cotton yarn and fabrics.	1. Netherlands.
	2. Coffee and tea.	2. Hardware.	2. Great Britain.
	3. Spices.	3. Machinery.	3. China.
	4. Cinchona bark.	4. Fertilizers.	4. United States.
	5. Tin.		
NEW ZEALAND—	1. Wool.	1. Textile fabrics.	1. Great Britain.
	2. Frozen meat.	2. Iron and steel manufactures.	2. Australia.
	3. Gold.	3. Sugar.	3. United States.
	4. Kauri gum (fossil).	4. Paper and stationery.	4. Pacific Islands.
	5. Dairy products.	5. Beverages.	5. India.
POLYNESIA—	1. Copra and cocoanuts.	1. Cotton goods.	1. Australia.
	2. Pearl and tortoise shell.	2. Hardware.	2. New Zealand.
	3. Tropical fruits.	3. Machinery.	3. Great Britain.
	4. Sugar.	4. Foodstuffs.	4. United States.
	5. Sago and spices.	5. Kerosene.	5. France.

WORLD CITIES RANKED ACCORDING TO POPULATION.

(From Statesman's Year Book and United States census for 1900. Numbers here given correspond to numbers given on world map.)

No.	Name.	Census.	Population.	Continent.
1.	London	1891	4,211,056	Europe.
2.	New York	1900	3,437,202	North America.
3.	Paris	1896	2,536,834	Europe.
4.	Berlin	1900	1,843,000	Europe.
5.	Chicago	1900	1,698,575	North America.
6.	Canton	*...	1,600,000	Asia.
7.	Tokio	1898	1,452,564	Asia.
8.	Vienna	1891	1,364,548	Europe.
9.	Philadelphia	1900	1,293,697	North America.
10.	St. Petersburg	1897	1,267,023	Europe.
11.	Peking	*...	1,000,000	Asia.
12.	Moscow	1897	988,614	Europe.
13.	Constantinople	1885	873,560	Europe.
14.	Calcutta	1891	861,764	Asia.
15.	Bombay	1891	821,764	Asia.
16.	Osaka	1898	821,235	Asia.
17.	Buenos Aires	1895	663,854	South America.
18.	Warsaw	1897	638,209	Europe.
19.	Hamburg	1895	625,552	Europe.
20.	Glasgow	1891	618,052	Europe.
21.	St. Louis	1900	575,238	North America.
22.	Cairo	1897	570,062	Africa.
23.	Brussels	1898	561,130	Europe.
24.	Boston	1900	560,892	North America.
25.	Naples	1898	540,393	Europe.
26.	Rio Janeiro	1890	522,651	South America.
27.	Liverpool	1891	517,980	Europe.
28.	Amsterdam	1898	512,953	Europe.
29.	Baltimore	1900	508,957	North America.
30.	Buda-Pesth	1891	505,763	Europe.
31.	Manchester	1891	505,368	Europe.
32.	Rome	1898	500,610	Europe.
33.	Melbourne	1891	490,900	Australia.
34.	Milan	1898	481,297	Europe.
35.	Birmingham	1891	478,113	Europe.
36.	Madrid	1887	470,283	Europe.
37.	Lyons	1896	466,028	Europe.
38.	Madras	1891	452,518	Asia.
39.	Marseilles	1896	442,289	Europe.
40.	Haidarabad	1891	415,039	Asia.
41.	Munich	1895	407,307	Europe.
42.	Odessa	1897	405,041	Europe.
43.	Mexico	1900	402,000	North America.
44.	Leipsic	1895	399,963	Europe.
45.	Sydney	1891	383,320	Australia.
46.	Cleveland	1900	381,768	North America.
47.	Shanghai	*...	380,000	Asia.
48.	Breslau	1895	373,169	Europe.
49.	Leeds	1891	367,505	Europe.
50.	Turin	1898	355,800	Europe.
51.	Kioto	1898	353,139	Asia.
52.	Buffalo	1900	352,387	North America.
53.	San Francisco	1900	342,782	North America.
54.	Dresden	1895	336,440	Europe.
55.	Cincinnati	1900	325,902	North America.
56.	Sheffield	1891	324,243	Europe.
57.	Pittsburg	1900	321,626	North America.
58.	Cologne	1895	321,564	Europe.
59.	Santiago (Chile)	....	320,628	South America.
60.	Alexandria	1897	319,766	Africa.
61.	Lodz	1897	315,209	Europe.
62.	Copenhagen	1890	312,859	Europe.
63.	Rotterdam	1898	309,309	Europe.
64.	Lisbon	1890	301,206	Europe.
65.	Stockholm	1898	295,789	Europe.
66.	Palermo	1898	290,951	Europe.
67.	New Orleans	1900	287,104	North America.
68.	Detroit	1900	285,704	North America.
69.	Milwaukee	1900	285,315	North America.
70.	Antwerp	1895	277,576	Europe.
71.	Lucknow	1891	273,028	Asia.
72.	Barcelona	1887	272,428	Europe.
73.	Edinburgh	1891	264,796	Europe.
74.	Bordeaux	1896	256,906	Europe.
75.	Riga	1898	256,197	Europe.
76.	Belfast	1891	255,950	Europe.
77.	Bangkok	*...	250,000	Asia.
78.	Montevideo	*...	249,251	South America.
79.	Kieff	1897	247,432	Europe.
80.	Newark	1900	246,070	North America.
81.	Dublin	1891	245,001	Europe.
82.	Nagoya	1898	244,145	Asia.
83.	Genoa	1898	232,777	Europe.
84.	Bucharest	1894	232,000	Europe.
85.	Frankfort-on-Main	1895	229,279	Europe.
86.	Bristol	1891	221,578	Europe.
87.	Hong Kong	1891	221,441	Asia.
88.	Benares	1891	219,467	Asia.
89.	Montreal	1891	216,650	North America.
90.	Bradford	1891	216,361	Europe.
91.	Lille	1896	216,276	Europe.
92.	Kobe	1898	215,780	Asia.
93.	Magdeburg	1895	214,424	Europe.
94.	Nottingham	1891	213,877	Europe.
95.	Florence	1898	212,898	Europe.
96.	Teheran	1881	210,000	Asia.
97.	Hanover	1895	209,535	Europe.
98.	Jersey City	1900	206,433	North America.
99.	West Ham	1891	204,903	Europe.
100.	Louisville	1900	204,731	North America.
101.	Minneapolis	1900	202,718	North America.
102.	Hull	1891	200,044	Europe.
103.	Damascus	*...	200,000	Asia.
104.	Seoul	*...	200,000	Asia.
105.	Smyrna	1885	200,000	Asia.
106.	The Hague	1898	199,285	Europe.
107.	Havana	....	198,270	North America.
108.	Salford	1891	198,139	Europe.
109.	Yokohama	1898	193,762	Asia.
110.	Delhi	1891	192,579	Asia.
111.	Mandelay	1891	188,815	Asia.
112.	Cawnpore	1891	188,712	Asia.
113.	Newcastle	1891	186,300	Europe.
114.	Prague	1891	184,109	Europe.
115.	Toronto	1891	181,220	North America.
116.	Bangalore	1891	180,366	Asia.
117.	Rangoon	1891	180,324	Asia.
118.	Tabriz	1881	180,000	Asia.
119.	Lahore	1891	176,854	Asia.
120.	Düsseldorf	1895	175,985	Europe.
121.	Providence	1900	175,597	North America.
122.	Allahabad	1891	175,246	Asia.
123.	Kharkorf	1897	174,841	Europe.
124.	Leicester	1891	174,624	Europe.

* Estimated.

* Estimated.

World Cities Ranked According to Population.—*Continued.*

No.	Name.	Census.	Population.	Continent.
125.	Bahia	1890	174,412	South America.
126.	Königsberg	1895	172,796	Europe.
127.	Valencia	1887	170,763	Europe.
128.	Liege	1898	169,202	Europe.
129.	Indianapolis	1900	169,164	North America.
130.	Agra	1891	168,662	Asia.
131.	Patna	1891	165,192	Asia.
132.	Kansas City	1900	163,752	North America.
133.	St. Paul	1900	163,065	North America.
134.	Ghent	1898	162,652	Europe.
135.	Rochester	1900	162,608	North America.
136.	Nuremberg	1895	162,386	Europe.
137.	Poona	1891	161,390	Asia.
138.	Chemnitz	1895	161,017	Europe.
139.	Vilna	1897	159,568	Europe.
140.	Portsmouth	1891	159,251	Europe.
141.	Jaipur	1891	158,905	Asia.
142.	Trieste	1891	158,344	Europe.
143.	Stuttgart	1895	158,321	Europe.
144.	Venice	1898	157,099	Europe.
145.	Bologna	1898	155,787	Europe.
146.	Dundee	1891	155,671	Europe.
147.	Messina	1898	154,436	Europe.
148.	Manila	1887	154,062	Asia.
149.	Tunis	*...	153,000	Africa.
150.	Zurich	1897	151,994	Europe.

*Estimated.

Smaller Cities of Great Commercial Importance.

A.—Auckland, Australasia.
B.—Ballarat, Australia.
Bu.—Butte, North America.
C. T.—Cape Town, Africa.
D.—Dawson City, North America.
Du.—Duluth, North America.
Ga.—Galveston, North America.
G.—Guayaquil, South America.
Iq.—Iquique, South America.
I.—Irkutsk, Asia.
J.—Johannesburg, Africa.
K.—Kiakhta, Asia.
Kim.—Kimberly, Africa.
M.—Mobile, North America.
N.—Nome City, North America.
Or.—Orenberg, Asia.
O.—Ottawa (Canada), North America.
Sea.—Seattle, North America.
S.—Singapore, Asia.
T.—Tomsk, Asia.
Val.—Valparaiso, South America.
V.—Victoria, North America.
W.—Winnipeg, North America.

FACTS ABOUT AMERICAN CITIES.

The census of 1900 enumerated 3715 organized villages, towns, and cities. The 25 largest cities are already given in the list of world cities.

Below is given the 161 important commercial centers of our nation, in alphabetical order. These are the cities that have a population of 25,000 or more inhabitants.

Rank.	Names.	Commercial Nicknames.
87.	Akron, Ohio	Oat Meal City, and Buckeye Reaper Town.
40.	Albany, N. Y.	Gate City of the Hudson.
27.	Allegheny, Pa.	Tannery City.
114.	Allentown, Pa.	
97.	Altoona, Pa.	
43.	Atlanta, Ga.	Gate City of the South.
149.	Atlantic City, N. J.	Beach City.
135.	Auburn, N. Y.	
94.	Augusta, Ga.	
6.	Baltimore, Md.	Monumental City; Oystertown.
151.	Bay City, Mich.	
125.	Bayonne, N. J.	
93.	Binghamton, N. Y.	
100.	Birmingham, Ala.	Iron City of the South.
5.	Boston, Mass.	City of Notions.
54.	Bridgeport, Conn.	
92.	Brockton, Mass.	Shoe City.
8.	Buffalo, N. Y.	Queen of the Lakes.
133.	Butte, Mont.	Copper City.
41.	Cambridge, Mass.	University City.
52.	Camden, N. J.	Pen City; Oilcloth City.
132.	Canton, Ohio.	McKinley City.
159.	Cedar Rapids, Iowa.	
68.	Charleston, S. C.	Palmetto City.
136.	Chattanooga, Tenn.	
118.	Chelsea, Mass.	
119.	Chester, Pa.	
2.	Chicago, Ill.	Grain City; Porkopolis.
10.	Cincinnati, Ohio.	Queen of the Ohio.
7.	Cleveland, Ohio.	Forest City; Sewing-Machine City.
28.	Columbus, Ohio.	
158.	Council Bluffs, Iowa.	
86.	Covington, Ky.	
88.	Dallas, Tex.	
115.	Davenport, Iowa.	
45.	Dayton, Ohio.	
25.	Denver, Col.	Queen of the Plains.
59.	Des Moines, Iowa.	
13.	Detroit, Mich.	City of the Straits.
108.	Dubuque, Iowa.	
72.	Duluth, Minn.	Zenith City of the Unsalted Seas.
160.	Easton, Pa.	
137.	East St. Louis, Ill.	
74.	Elizabeth, N. J.	Singer City.
113.	Elmira, N. Y.	

Rank.	Names.	Commercial Nicknames.
73.	Erie, Pa.	
64.	Evansville, Ind.	
33.	Fall River, Mass.	Cloth City.
128.	Fitchburg, Mass.	
83.	Fort Wayne, Ind.	
152.	Fort Worth, Tex.	
103.	Galveston, Tex.	Cotton City; Hurricane City.
154.	Gloucester, Mass.	Fisherman's Town.
44.	Grand Rapids, Mich.	Furniture City.
77.	Harrisburg, Pa.	
49.	Hartford, Conn.	Insurance City.
105.	Haverhill, Mass.	Shoe City.
63.	Hoboken, N. J.	
82.	Holyoke, Mass.	Paper City.
95.	Honolulu, Hawaii	Island Queen.
85.	Houston, Tex.	
21.	Indianapolis, Ind.	Railroad City.
161.	Jackson, Mich.	
143.	Jacksonville, Fla.	Pineapple City.
17.	Jersey, N. J.	Transportation City.
112.	Johnstown, Pa.	Flood City.
138.	Joliet, Ill.	
155.	Joplin, Mo.	Zinc City.
76.	Kansas City, Kan.	
22.	Kansas City, Mo.	
126.	Knoxville, Tenn.	
141.	La Crosse, Wis.	
90.	Lancaster, Pa.	
57.	Lawrence, Mass.	
153.	Lexington, Ky.	
91.	Lincoln, Neb.	
101.	Little Rock, Ark.	
36.	Los Angeles, Cal.	Fruit City.
18.	Louisville, Ky.	Falls City.
39.	Lowell, Mass.	City of Spindles.
55.	Lynn, Mass.	Shoe Metropolis.
121.	Malden, Mass.	
65.	Manchester, N. H.	
116.	McKeesport, Pa.	
37.	Memphis, Tenn.	
14.	Milwaukee, Wis.	Cream City; Schlitz's Town.
19.	Minneapolis, Minn.	Flour City.
99.	Mobile, Ala.	
134.	Montgomery, Ala.	
47.	Nashville, Tenn.	
16.	Newark, N. J.	Trunk City.
58.	New Bedford, Mass.	Codfish City.
157.	New Britain, Conn.	
144.	Newcastle, Pa.	
31.	New Haven, Conn.	Elm City.
12.	New Orleans, La.	Sugar City; Crescent City.
145.	Newport, Ky.	
123.	Newton, Mass.	
1.	New York, N. Y.	Empire City; Gotham; commercial Emporium.
80.	Norfolk, Va.	
56.	Oakland, Cal.	
35.	Omaha, Neb.	
146.	Oshkosh, Wis.	
150.	Passaic, N. J.	
32.	Paterson, N. J.	Silk City.
96.	Pawtucket, R. I.	
67.	Peoria, Ill.	Distillery City.
3.	Philadelphia, Pa.	City of Brotherly Love; Centennial City.
11.	Pittsburg, Pa.	Steel City; Pickle Town; Smoky City.
78.	Portland, Me.	Hill City.
42.	Portland, Ore.	
20.	Providence, R. I.	Jewelry City; has largest cotton factory in the world.
148.	Pueblo, Col.	Steel City of the West.
100.	Quincy, Ill.	
140.	Racine, Wis.	Carriage City.
50.	Reading, Pa.	
46.	Richmond, Va.	Cockade City.
24.	Rochester, N. Y.	Flower City; Aqueduct City.
130.	Rockford, Ill.	Watch City.
139.	Sacramento, Cal.	
89.	Saginaw, Mich.	
111.	Salem, Mass.	Shoe City.
70.	Salt Lake City, Utah.	Mormon City.
71.	San Antonio, Tex.	
9.	San Francisco, Cal.	Golden Gate.
69.	Savannah, Ga.	Forest City of the South.
127.	Schenectady, N. Y.	Locomotive City.
38.	Scranton, Pa.	Anthracite City.
48.	Seattle, Wash.	
124.	Sioux City, Iowa.	
61.	Somerville, Mass.	
110.	South Bend, Ind.	Wagon City.
156.	South Omaha, Neb.	
106.	Spokane, Wash.	
117.	Springfield, Ill.	
60.	Springfield, Mass.	Gun City.
102.	Springfield, Ohio.	
34.	St. Joseph, Mo.	
4.	St. Louis, Mo.	Mound City; River Metropolis.
23.	St. Paul, Minn.	Fur City; North Star City.
129.	Superior, Wis.	
30.	Syracuse, N. Y.	
104.	Tacoma, Wash.	
31.	Taunton, Mass.	
107.	Terre Haute, Ind.	
26.	Toledo, Ohio.	Spice City.
122.	Topeka, Kan.	
53.	Trenton, N. J.	Pottery City.
62.	Troy, N. Y.	Nail City.
66.	Utica, N. Y.	Rose City.
15.	Washington, D. C.	City of Magnificent Distances; Federal City.
81.	Waterbury, Conn.	Clock City.
98.	Wheeling, W. Va.	Glass City.
75.	Wilkesbarre, Pa.	
142.	Williamsport, Pa.	
51.	Wilmington, Del.	Match City.
147.	Woonsocket, R. I.	
29.	Worcester, Mass.	
79.	Yonkers, N. Y.	
120.	York, Pa.	
84.	Youngstown, Ohio.	

The following cities of less than 25,000 inhabitants are noted for special commerce:

Amsterdam, N. Y.—Carpet City.
Astoria, Ore.—Salmon City.
Bangor, Me.—Lumber City.
Barre, Vt.—Marble City.
Brattleboro, Vt.—Organ City.
Burlington, Iowa—Orchard City.
Danbury, Conn.—Hat City.
Elgin, Ill.—Dairy City; Watch City.
Gloversville, N. Y.—Glove City.
Grand Junction, Colo.—Peach City.
Greeley, Colo.—Potato City.

Hutchinson, Kan.—Salt City.
Iola, Kan.—Cement City.
Jacksonville, Fla.—Pineapple City.
Kalamazoo, Mich.—Celery City.
Key West, Fla.—Sponge City.
Leavenworth, Kan.—Apple City.
Lynchburg, Va.—Tobacco City.
Madison, Wis.—Lake City.
Napa, Cal.—Wine City.
Nashville, Tenn.—Rock City.
Nome City, Alaska—Gold City.
Raleigh, N. C.—Oak City.
Rocky Ford, Colo.—Watermelon City.
Salem, Ore.—Hop City.
Savannah, Ga.—Cotton City.
Sheboygan, Wis.—Evergreen City.
Virginia City, Nev.—Silver City.
Wichita, Kan.—Corn City.
Zanesville, Ohio—Brick City.

The "Oregon" and one of the great Dry Docks—Brooklyn Navy Yard.

MEANING OF GEOGRAPHICAL TERMS.

1. *By* is an old Anglo-Saxon word, meaning *town*. Whitby—White town; Derby—Deer town.

2. *Chester* is derived from the Latin word *castra,* meaning *camp*. The sites of old Roman camps in England are thus preserved in names of English cities: Worcester—War's camp; Leicester—Lee's camp; Manchester; Lancaster; Chichester, etc.

3. *Shire* — English suffix, meaning *province* ruled by an earl; nearly synonymous with our American county. Yorkshire, Berkshire, etc.

4. *Terra* is a Latin word for *earth,* or *land*. Mediterranean — in the middle of the land (Europe and Africa); Tierra del Fuego — land of fire.

5. *Metropolis* is derived from two Greek words, meaning *Mother City;* hence, the commercial center of a region.

6. *de* is from the Romance languages, and means *of*.

7. *Rio* is from a similar source, and means *river*. Rio de Janeiro — River of January.

8. In naming many rivers and cities in the United States, Indian names have been used that are not only suggestive but unique and historic — often the only relic of aboriginal days.

(*a*) The island upon which part of the present city of New York stands was traded for by the Dutch in an early day. The Dutch gave the Indian owners "fire-water." By these Indians the island was given the name it still bears, Manhattan — meaning, "*The place where we all got drunk.*"

(*b*) Minnehaha — Laughing water.

(*c*) Hiawatha — An Indian hero.

(*d*) Oklahoma — The beautiful land.

(*e*) Wabaunsee — Dawn of day.

(*f*) Mohawk, Ojibway, Ottawa, Onondaga, Ontario, Wyandotte, etc., were names of tribes of Indians.

9. Dalny is the recent name (1901) Russia has given Talienwan, and means "*far away.*"

10. The Chinese have the most descriptive names of any commercial nation, and by Europeans and Americans they are generally the least understood.

(*a*) *Fu* is a suffix added to provincial capitals, as we add the explanatory terms "court house" or "county seat." Chang Chow fu illustrates this.

(*b*) *Hai* means the sea.

(*c*) *Hoang* means yellow. Hoang hai is therefore Yellow sea, so called as the Hoang river cuts its way through a yellow soil, turning the water yellow where it enters into the sea.

(*d*) *Ho* means river. Hoang ho — Yellow river.

(*e*) *Kiang* also means river, but is used in the superlative degree. *Yang* means *ocean; tse* means *son*. Hence, Yang tse Kiang means *Ocean, son of the river*. The Chinese of antiquity believed this river to be greater than the ocean into which its waters emptied; hence its name.

(*f*) *Kow* means *north city*. Hankow — city north of Han river.

(*g*) *King* means capital.

(*h*) *Nan* means *south*. Nanking—south capital.

(*i*) *Pe* means *north*. Peking — north capital.

(*j*) *Pei* means *white*. Pei ho — white river.

(*k*) *Tien* means heavenly.

(*l*) *Tsin* means *place*. Tien Tsin, therefore, means *heavenly place* — revealing in the name the pains the Chinese have taken to render it a delightful place. That world-traveler, Marco Polo, who visited this city 600 years ago, named it the "citta celeste."

(*m*) *Yum* means *transportation*. Yum ho is the Chinese name for their Imperial canal, and means "*River of Transportation.*"

(*n*) *Shanghai* means "*city by the sea.*"

The Japanese in a similar way describe their towns as they name them.

MARINE COMMERCE

OF

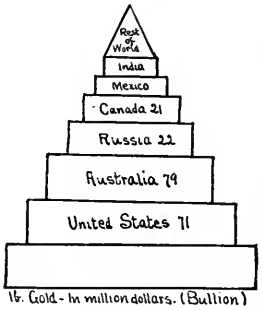
IMPORTANT COMMERCIAL NATIONS.

A Trip Through The World's Great Pyramids.

[These statistics are from the latest reliable sources and with but few exceptions represent the data for 1900.]

I. Mineral Pyramids.

1a Gold in million dollars



1b. Gold - In million dollars. (Bullion)

1 United States 1020

2 France 810

3 Russia 792

4 Germany 607

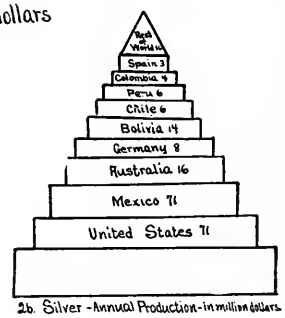
5 Great Britain 487

6 Austria 244

7 Australia 128

8 Italy 98

2a. Silver in million dollars



2b. Silver - Annual Production - In million dollars.

1 China 750

2 United States 643

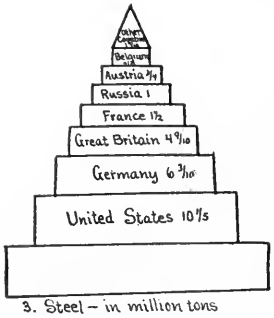
3 France 432

4 India 389

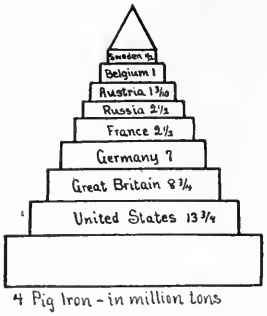
5 Spain 244

6 Straits Settlements 242

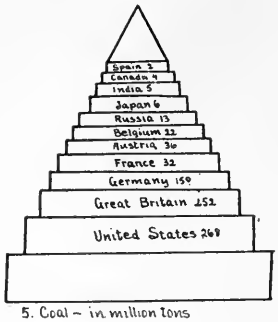
7 Germany 208



3. Steel – in million tons

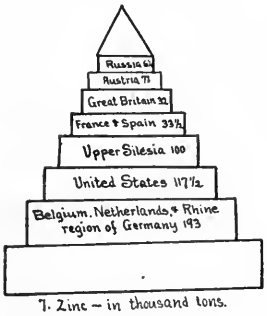


4 Pig Iron – in million tons

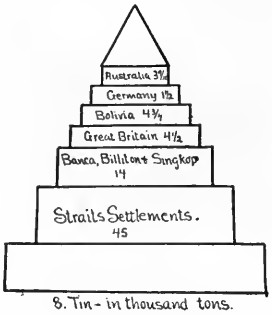


5. Coal – in million tons

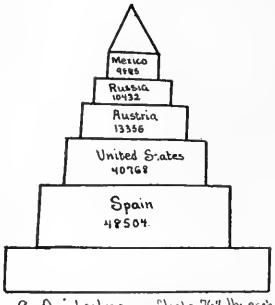
6. Copper – in thousand tons



7. Zinc – in thousand tons.



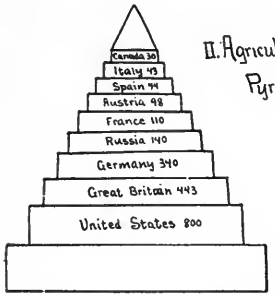
8. Tin – in thousand tons.



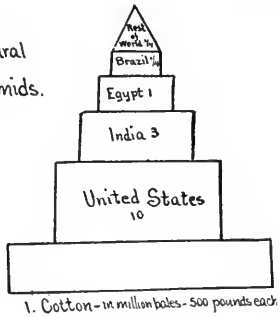
9. Quicksilver – in flasks, 76½ lbs each

10 Crude Petroleum – in million barrels, 42 gal each

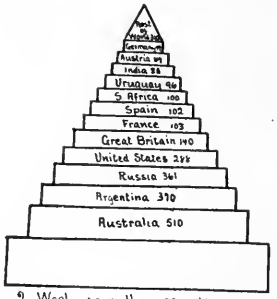
II. Agricultural Pyramids.



11. Total Annual Mineral Products '99.

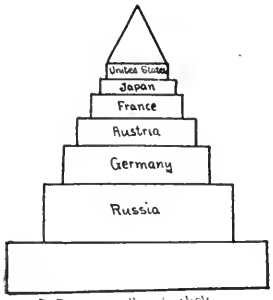


1. Cotton – in million bales – 500 pounds each

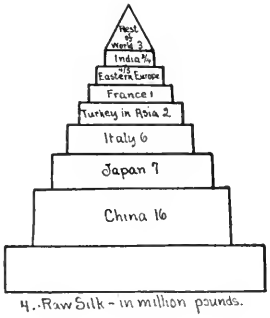


2. Wool – in million pounds

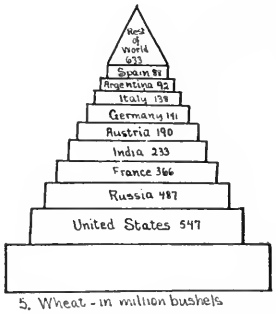
3 Flax – in thousand tons.



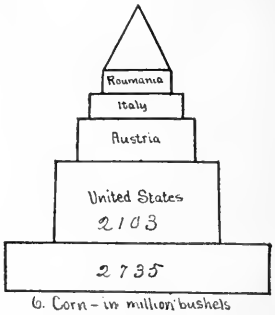
7. Rye – in million bushels.



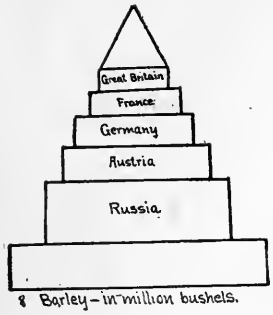
4. Raw Silk – in million pounds.



5. Wheat – in million bushels

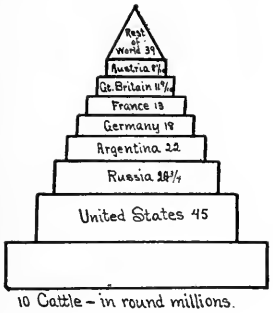


6. Corn – in million bushels

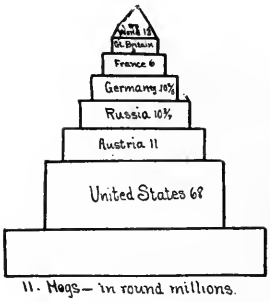


8 Barley – in million bushels.

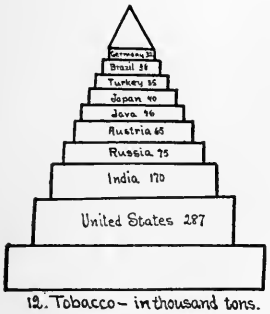
9. Dairy Products – in thousand tons.



10 Cattle – in round millions.



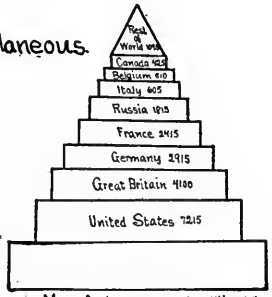
11. Hogs – in round millions.



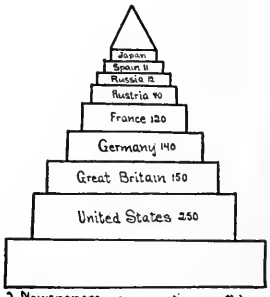
12. Tobacco – in thousand tons.

III Miscellaneous.

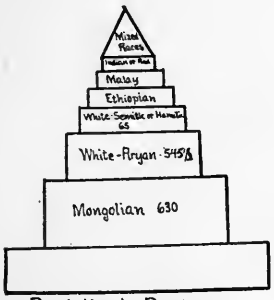
13. Hops – in cwts.



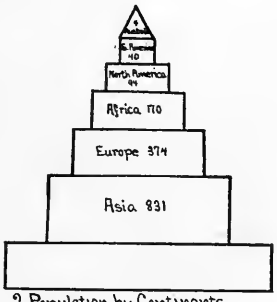
1. Manufactures – value in million dollars



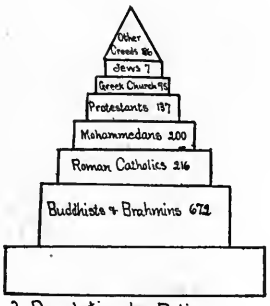
3. Newspapers – comparative monthly issues in million copies



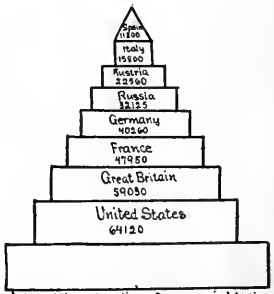
Population by Races.
In round millions.



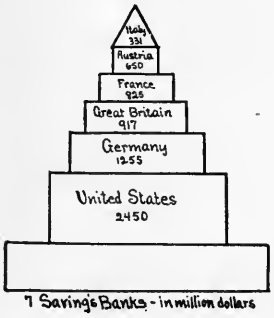
2. Population by Continents.
In round millions.



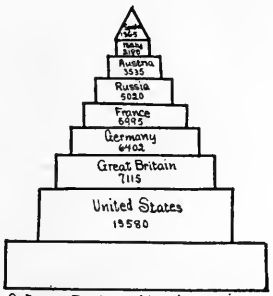
3. Population by Religions
In round millions.



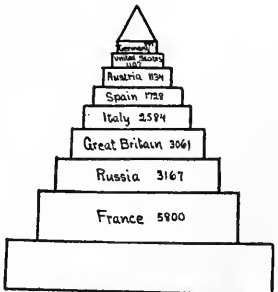
6. Wealth of Leading Commercial Nations (Mulhall) in million dollars



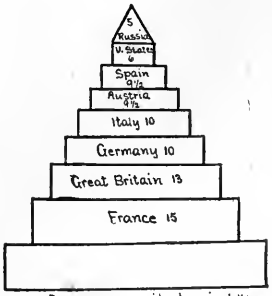
7 Savings Banks – in million dollars



8 Annual Earnings of Leading Nations (Mulhall) – in million dollars.



9. Public Debt of Leading Nations in million dollars.



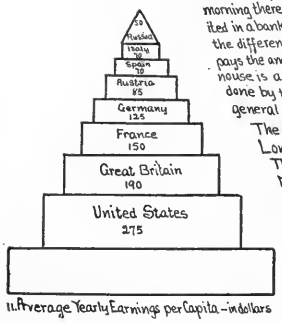
10. Average per capita tax – in dollars.

Clearing Houses.

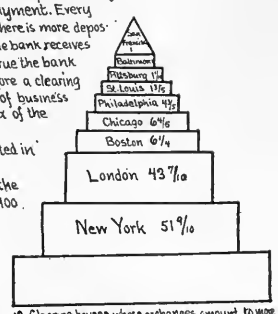
A Clearing House is an institution established by the banks of a commercial center, to which all checks drawn upon one city bank and deposited in another are sent for payment. Every morning there is a clearance of accounts. If there is more deposited in a bank than there is drawn upon it, the bank receives the difference in cash. If the opposite is true the bank pays the amount of the difference. Therefore a clearing house is a bank of banks. The amount of business done by the clearing house is an index of the general conditions of business.

The first clearing house was started in London.

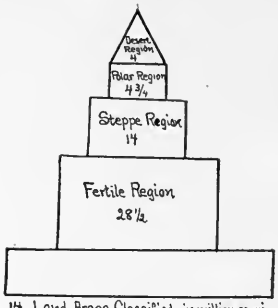
The average daily clearings in the New York clearing house in 1900 was 171 million dol



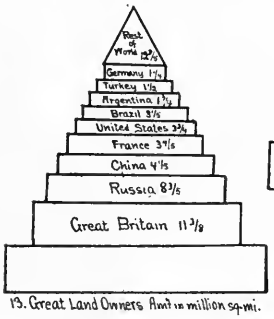
11. Average Yearly Earnings per Capita. - in dollars



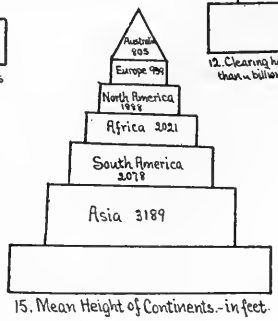
12. Clearing houses whose exchanges amount to more than a billion dollars each year. Amounts in billion dollars.



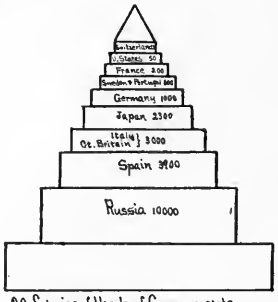
14. Land Areas Classified. - in million sq. mi. (Estimated, exact area not known.)



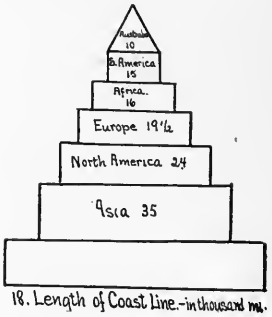
13. Great Land Owners And in million sq. mi.



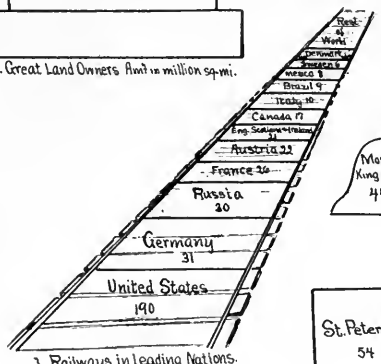
15. Mean Height of Continents. - in feet.



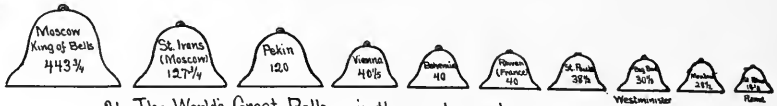
20 Salaries of Heads of Governments
In thousand dollars.



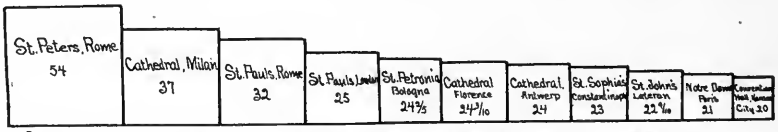
18. Length of Coast Line. - in thousand mi.



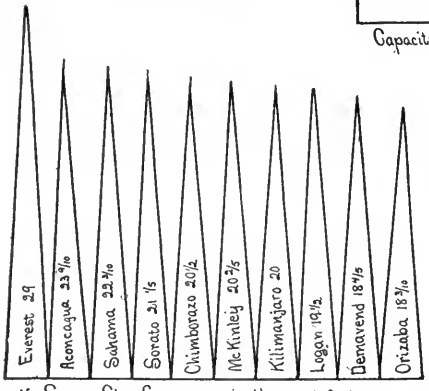
7. Railways in Leading Nations.
In thousand miles



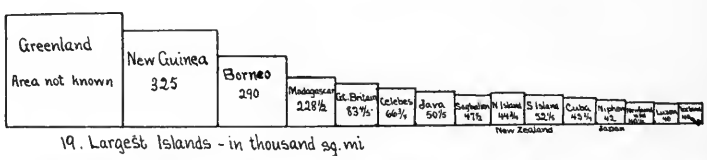
21. The World's Great Bells. - in thousand pounds.



Capacity of Large Rooms: — in thousands. Estimation allows a space 19.9 inches square to each person.

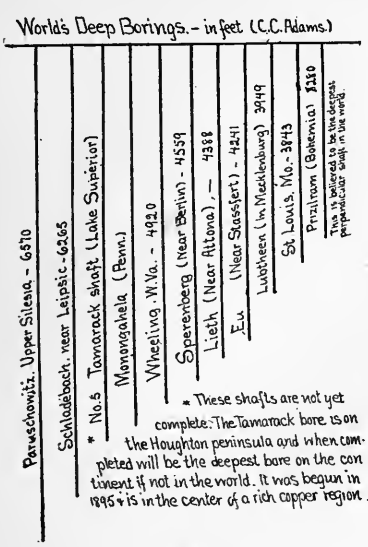


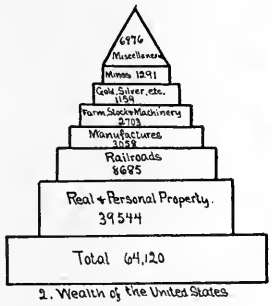
16. Some Sky Scrapers - in thousand feet.



19. Largest Islands - in thousand sq. mi

17. Ocean Areas — in million sq. mi. (Estimated, exact area not known.)

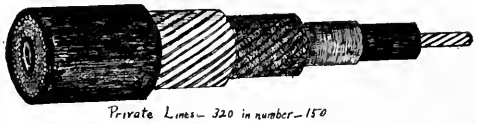




2. Wealth of the United States

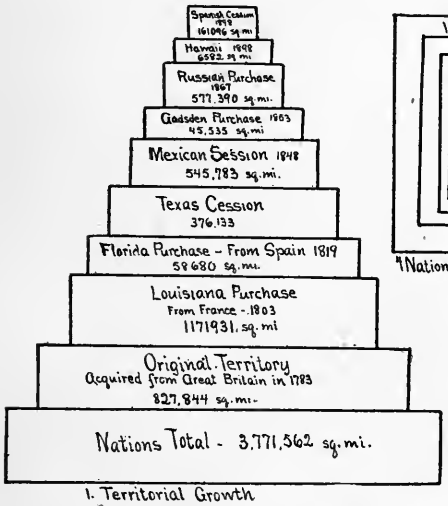
SOME DIAGRAMS
ALL OUR OWN.
U.S. Statistical Facts.

25. World's Cables - in thousand miles.

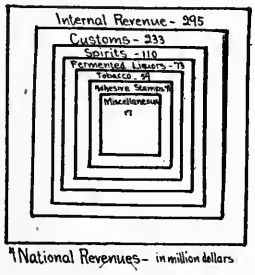

Private Lines — 320 in number — 150


Government lines — 20

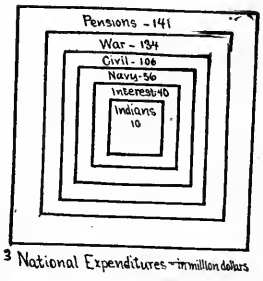
24. World's Telegraph Lines - in thousand miles. (U.S. Bureau of Statistics.)



1. Territorial Growth



4 National Revenues - in million dollars



3 National Expenditures - in million dollars

	1790	1800	1810	1820	1830	1840
Im	23	91 1/5	85 1/5	74 1/5	62 7/10	98 1/5
Ex	20 1/2	70 9/10	66 7/10	69 1/5	71 3/5	123 3/5

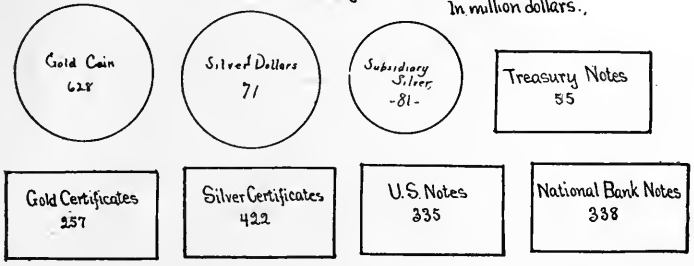
	1850	1860	1870	1880	1890	1900
Im	173 1/2	353 3/5	435 9/10	667 9/10	789 9/10	849 9/10
Ex	144 3/10	333 1/2	392 7/10	835 4/5	857 4/5	1394 3/10

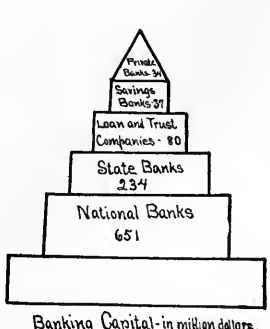
7. Our Commerce. A Century Old. By Decades. In million dollars.

	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901
Rec.	392 7/10	354 9/10	385 4/5	297 7/10	313 3/5	326 9/10	347 7/10	406 3/10	515 9/10	567 1/5	587 3/5
Ex.	355 3/8	345	383 3/5	367 1/2	356	352	365 7/10	443 1/10	605	487 7/10	509 9/10

6. Net Receipts & Expenditures of the United States Governments for Past Decade - In million dollars.

5. Money in circulation
In million dollars.

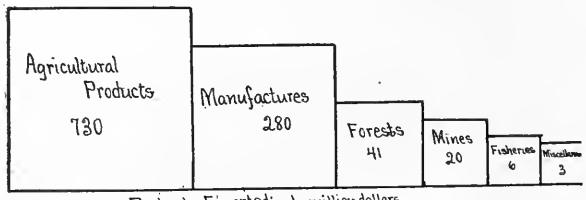




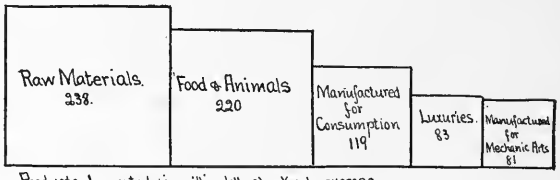
Banking Capital - in million dollars. (Yearly Average)

1790	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900
3 9/10	5 3/10	7 1/5	9 3/5	12 4/5	17	23	31 2/5	38 1/2	50	62 3/5	76 3/5

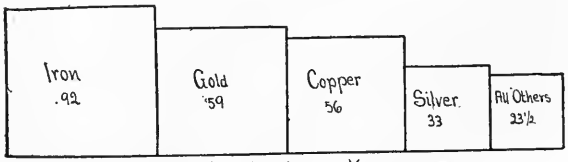
Our Growth in Population, by Decades, in millions



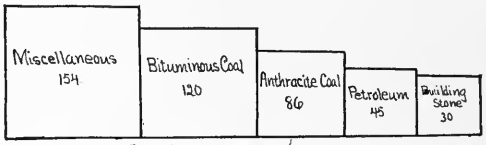
10. Products Exported.—In million dollars



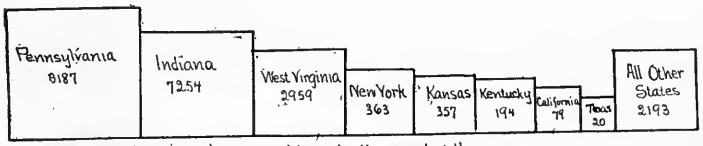
Products Imported. (in million dollars) Yearly average.



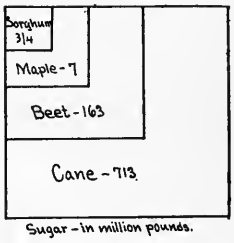
Metallic Ores Mined.—(in million dollars) (Yearly average.



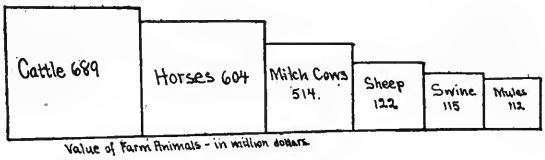
Non metallic Ores Mined. (in million dollars) Yearly average



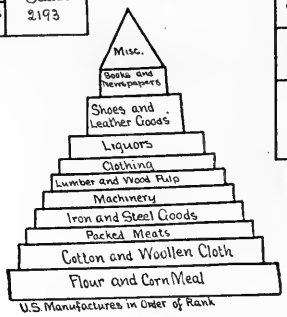
Natural Gas Production - 1900 · Value in thousand dollars.



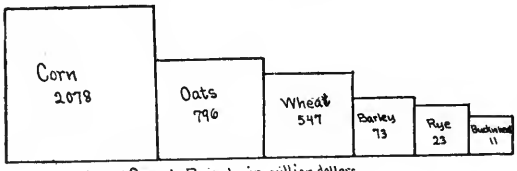
Sugar - in million pounds.



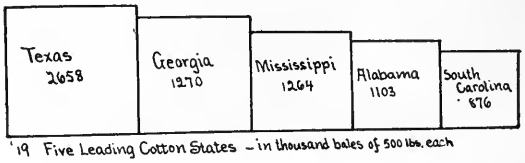
Value of Farm Animals - in million dollars



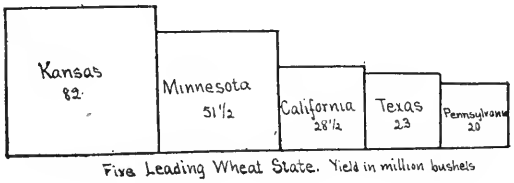
U.S. Manufactures in Order of Rank



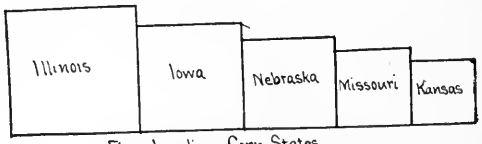
Value of Cereals Raised - in million dollars



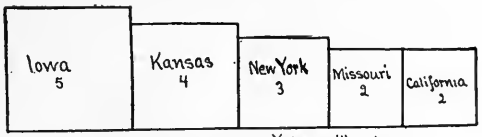
'19 Five Leading Cotton States - in thousand bales of 500 lbs. each



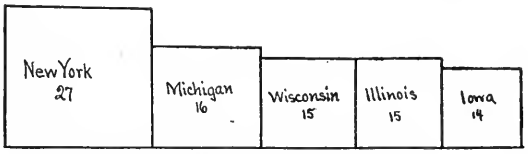
Five Leading Wheat State. Yield in million bushels



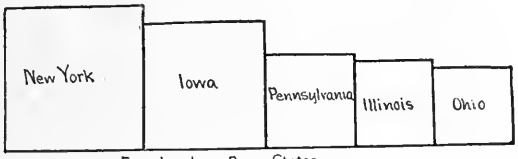
Five Leading Corn States.



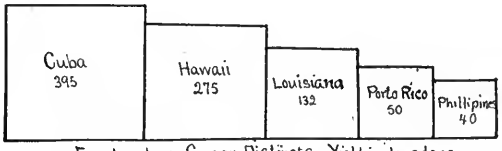
Five Leading Hay Producing States. Yield in million tons.
New York crop brought the greatest returns in the market.



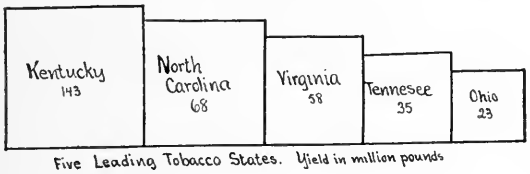
Five Leading Potato States Yield in million bushels.



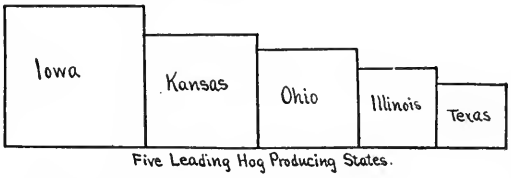
Five Leading Dairy States



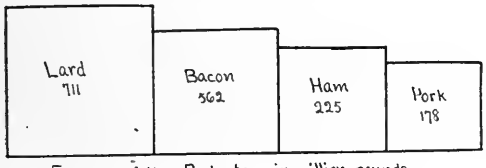
Five Leading Sugar Districts. Yield in long tons.



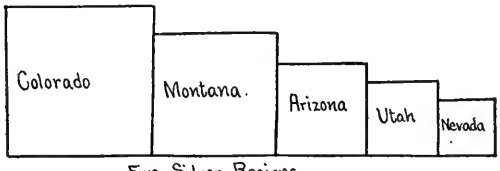
Five Leading Tobacco States. Yield in million pounds



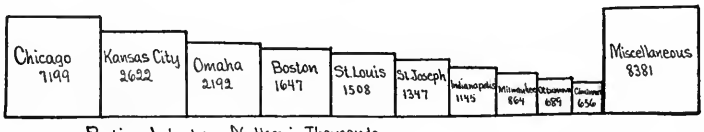
Five Leading Hog Producing States.



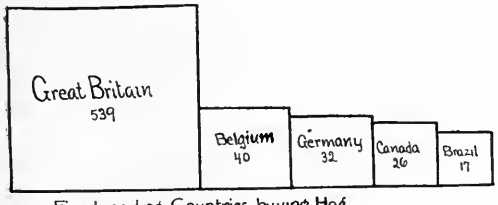
Exports of Hog Products - in million pounds.



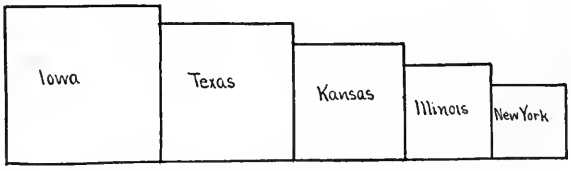
Five Silver Regions



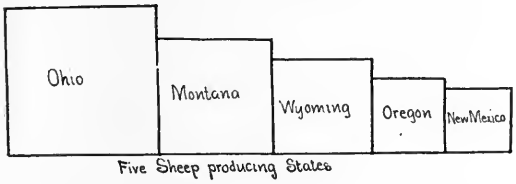
Packing Industry. No. Hogs in Thousands.



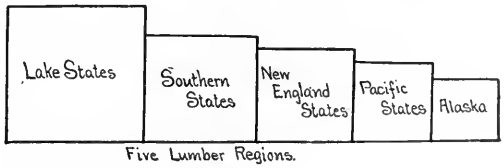
Five Leading Countries buying Hog products of the United States - in million lbs.



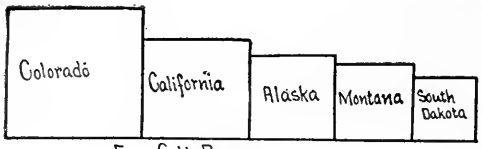
Five Cattle producing States



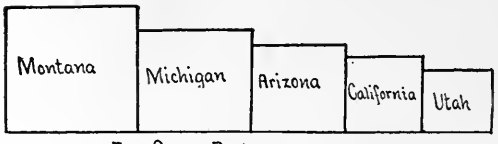
Five Sheep producing States



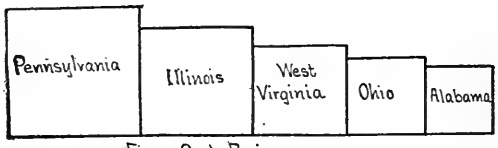
Five Lumber Regions.



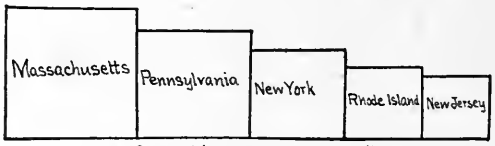
Five Gold Regions



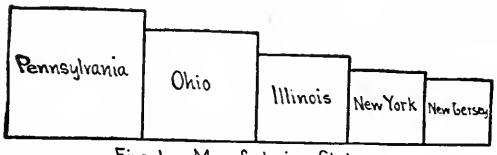
Five Copper Regions



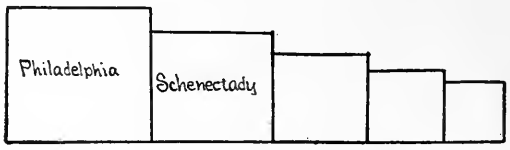
Five Coal Regions.



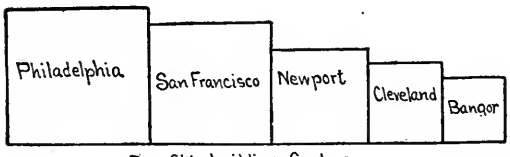
Five States Manufacturing Textile Fabrics.



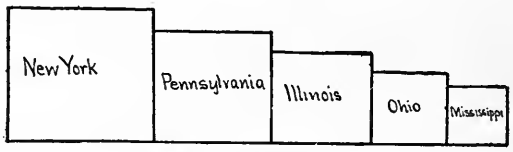
Five Iron Manufacturing States.



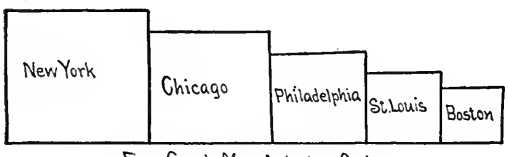
Five Car and Locomotive Works.



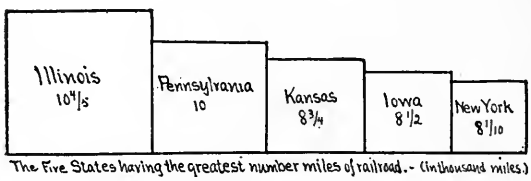
Five Ship building Centers



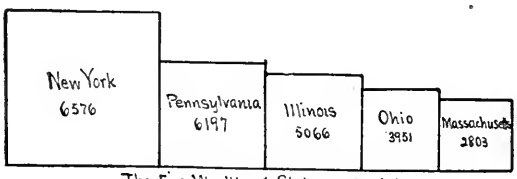
The Five Most Populous States



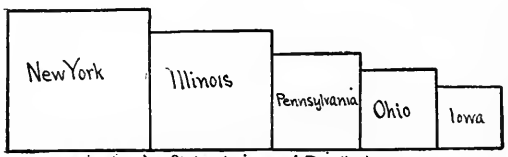
Five Great Manufacturing Centers



The Five States having the greatest number miles of railroad.- (in thousand miles.)

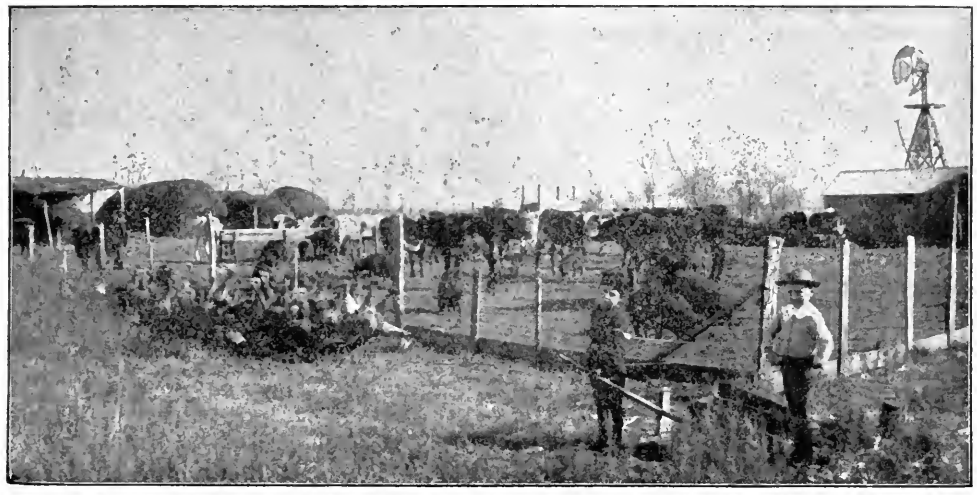


The Five Wealthiest States. - (in million dollars)



The Five Leading States in issue of Periodicals.

STATE SUPPLEMENT.



Only a Part of the Family.

The State can best be studied by the progressive outline plan. Have pupils provided with an outline book, and take up the work according to the following plan, using a page or more for each topic named.

Each pupil should be encouraged to bring in supplemental facts. This not only enriches the work, but cultivates a spirit of investigation.

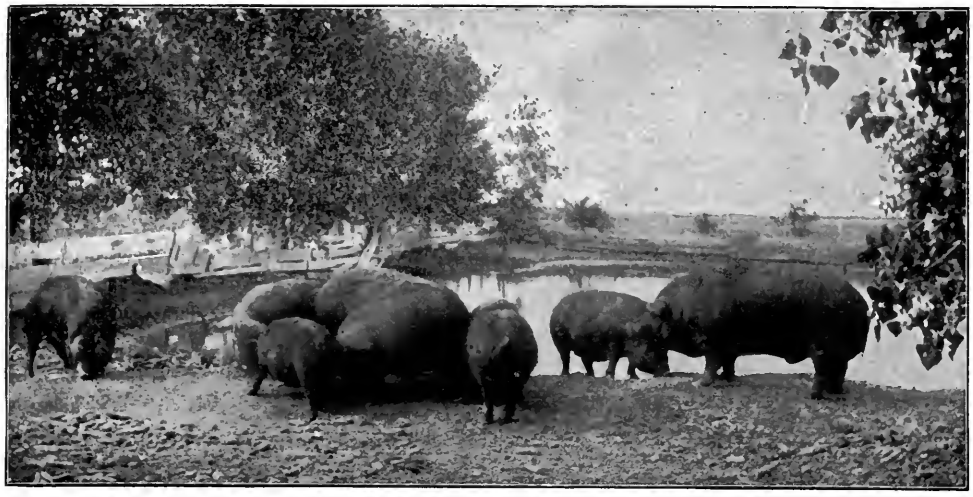
I. State Boundaries.

1. Draw in books, outline of State, and properly name and locate its geographical boundaries.

II. Counties of your Congressional District.

1. Plat and locate in State, the counties in your own Congressional District.

Too much Corn for his Cribs.—Rice County, Kansas.



One way to Compound Interest—in Kansas.

2. Discuss the legislative, executive and judicial arms of your Federal Government.

III. Counties of your State Senatorial and Representative Districts.

1. Plat and locate in State the district that elects your Representative and the district that elects your Senator to the Legislature.

2. Discuss the legislative, executive and judicial arms of your State Government.

IV. Rivers of State.

1. Name and locate in map form.

V. Cities of First Class.

1. Name and locate all cities of first class in your State.

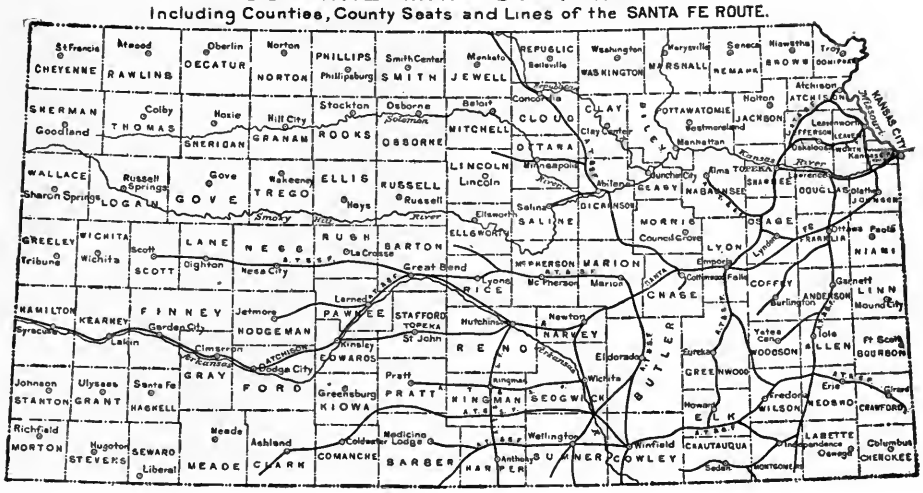
2. What industrial plants are located in these cities?

VI. Twenty-five most important Second- and Third-Class Cities.

Harvesting the Season's third Alfalfa Crop.

OUTLINE MAP OF KANSAS.

Including Counties, County Seats and Lines of the SANTA FE ROUTE.



1. Name and locate each one on a drawn map.

VII. Educational Institutions.

1. Name, locate, and describe.

VIII. Benevolent Institutions.

1. Name, locate, and describe.

IX. Penal Institutions.

1. Name, locate, and describe.

X. Railroad Lines crossing the State.

1. On State outline, trace one road at a time.
2. Have a separate page for each railroad, so that each line may be clearly shown without its competitors for trade.
3. Locate all the important cities along the line of road in the State.
4. In Kansas a separate page and a separate State outline map should be used for the following lines:
   - (*a*) Santa Fe.
   - (*b*) Union Pacific.
   - (*c*) Missouri Pacific.
   - (*d*) Rock Island.
   - (*e*) Missouri, Kansas & Texas.
   - (*f*) "Frisco" (St. Louis & San Francisco, including the newly acquired Memphis Route).

XI. Railroad Map of State.

XII. Agricultural, Mineral and Industrial Statistics for the State.

XIII. History of State.

1. First settlement. When? Where?
2. When organized as a Territory?
3. When admitted as a State?
4. Names of persons instrumental in early State development.
5. Most important incidents and facts in State's history. (Limit to *five*.)

Kansas Summary.

Kansas is forty years old.

With her more than fifty million acres of fertile land she can furnish good homes for many times the people now numbered among the Kansans.

The Kansas hen in three years gives her owners more money than the whole Louisiana Purchase cost this nation of ours — $15,000,000.

The "family cow" each year furnishes enough milk, butter and cheese to supply the 500,000 school children of Kansas with their school books and give each of our State and denominational colleges a $150,000 endowment fund.

How Wheat grows in Kansas.

Kansas has twelve million bearing fruit trees and 13,000 acres of luscious grapes and berries.

The "busy bee" supplies us with one and a half million pounds of the best honey every two years.

The whole nation is astonished at Kansas' 1900 record of 77,000,000 bushels of wheat, 135,000,000 bushels of corn, 30,000,000 bushels of oats, 7,500,000 bushels of potatoes, 50,000 pounds of cotton, 1,500,000 bushels of flax, 18,500,000 bushels of broom-corn, 5,000,000 tons of hay and fodder crops, and $75,000,000 worth of dressed meats.

Kansas points proudly to her immeasurable beds of building-stone, zinc, lead, gypsum, brick-clay, coal, oil, and gas.

The statistician says that Kansas has the largest salt plant, the largest smelter, the most extensive cement plant, the very finest brick, and the largest apple orchard in the world.

We have 6000 churches, 9200 free public schools, 490 banks with $51,000,000 *surplus* deposited, 9000 miles of railway, and good wagon-roads *everywhere*.

We now number one and one-half millions of contented, happy people who know Whittier's "Song of the Kansas Emigrant," and whose children sing with Ironquill:

"We all believe in Kansas: she's our State,
With all the elements to make her great—
Young men, high hopes, proud dreams—'t is ours to see
The State succeed to what the State should be."

Kansas Statistics.

I. Population.

1. State 1,468,808
2. Five most populous counties, in round numbers:
   1. Wyandotte 74,000
   2. Shawnee 56,000
   3. Sedgwick 44,000
   4. Leavenworth 40,000
   5. Crawford 40,000
3. Twenty-five largest cities, in order of rank:
   1. Kansas City 53,625
   2. Topeka 38,067
   3. Wichita 24,472
   4. Leavenworth 22,392
   5. Atchison 16,617
   6. Pittsburg 12,676
   7. Lawrence 11,358
   8. Fort Scott 10,751

Growing a Bank Account in Kansas.

9. Hutchinson 10,009
10. Emporia 9,477
11. Parsons 8,477
12. Galena 8,017
13. Ottawa 7,447
14. Arkansas City 7,045
15. Iola 6,787
16. Salina 6,657
17. Winfield 6,571
18. Newton 6,525
19. Argentine 6,515
20. Independence 5,628
21. Coffeyville 5,259
22. Chanute 4,953
23. Junction City 4,889
24. Wellington 4,406
25. Concordia 4,008

II. Area.

1. State ..... 52,000,000 acres.
   Breadth ..... 210 miles.
   Length ..... 400 miles.
2. Largest county — Butler — contains 913,920 acres.
3. Smallest county—Wyandotte—contains 97,920 acres.

How many square miles in each of these counties?

4. Altitude —
   Eastern limit 750 feet above sea-level.
   Western limit at Colorado line 3300 feet above sea-level.

III. Weather Report — averages from U. S. Weather Service for Kansas for 14 years.

1. Temperature —
   Average temperature for December, January, February, 31° F.
   Average temperature for June, July, August, 76.3° F.
   Average annual temperature for the State, 54.1° F.
2. Precipitation of moisture —
   Average precipitation for December, January, February, 0.96 inch.
   Average precipitation for each of the months June, July, August, 3.22 inches.
   Average annual precipitation for the eastern third of State, 34 inches.
   Average annual precipitation for entire State, 26.17 inches.

IV. Distances from Kansas City, Kansas, the State's chief commercial center, to the chief centers of domestic commerce.

	Miles.
Omaha	205
St. Louis	283
Chicago	458
Buffalo	1017
Baltimore	1217
Pittsburg	896
Philadelphia	1250
New York	1345
Boston	1504

	Miles.
Savannah	1081
New Orleans	878
Galveston	790
Denver	640
San Francisco	2100
Seattle	2234

V. Commercial Products in round numbers—1900.

(Taken from Secretary F. D. Coburn's reports.)

1. Products of live stock, value...$88,000,000
2. Farm crops, quantity—

	Bushels.
Wheat	77,000,000
Corn	134,000,000
Oats	30,000,000
Broom corn	18,500,000
Barley	3,300,000
Potatoes, Irish	7,500,000
Flax	1,500,000
Hay crop (tame, tons)	1,200,000
Hay crop (prairie, tons)	1,400,000

Total value of all farm crops, $113,300,000.

3. Garden vegetables and horticultural products, $1,500,000.
4. Mineral products, $18,000,000.
5. Average annual value of commercial products at present time (1902), $190,000,000.
6. Total value of agricultural products alone, from 1882 to 1901 inclusive $2,750,000,000.

PRONOUNCING VOCABULARY.

Abercorn, ăb′-ẽr-kōrn
Aconcagua, ä-kŏn-kä′-gwä
Admiralty, ăd′-mĭ-ral′-tĭ
Aleppo, ā-lĕp′-ō
Allahabad, äl-ä-hä-bäd′
Amsterdam, ăm′-stẽr-dăm
Amur, ä-mōōr′
Angelus, ăn′-jĕl-ŭs
Apia, ä′-pē-ä
Argentine, är′-jĕn-tīn
Arkansas, är′kăn-sạ′
Asafoetida, ăs′-ȧ-fĕt′-ĭ-dȧ
Atbara, ät-bä′-rä
Auckland, ạk′-land
Bagamoyo, bạg-ȧ-mō′-yō
Bahia, bä-ē′-ä
Baikal, bī-käl′
Baireuth, bī′-roit
Baku, bä-kōō′
Ballarat, băl-a-răt′
Balkash, bäl′-käsh′
Baluchistan, băl-ōō-chĭs-tän′
Banca, băṇk′-a
Bangalore, băṉ′-gȧ-lōr′
Barre, băr′-rē
Bassorah, bäs′-ō-rä
Bathurst, băth′-ẽrst
Bayonne, bā-yŏn′; Fr. bä′-yŭn′
Beirut, bā′-rōōt
Benares, bĕn-ä′-rĕz
Bokhara, bŏk-ä′-rä
Bolivia, bō-lĭv′-ī-ȧ
Bologna, bō-lōn′-yä
Bornholm, bŏrn′-hōlm
Brahmaputra, brä′-mȧ-pōō′-trȧ
Bucharest, bū′-kȧ-rĕst′
Buda Pesth, bōō′-dŏ-pĕst
Buenos Aires, bwā′-nōs-ī-rĕz
Cairo (Afr.), kī′-rō
Cairo (Ill.), kā′-rō
Calais, kȧl′-ĭs, Fr. kä-lā′
Carysfort, kâr′-ĭs-fōrt
Caucasus, kạ′-kȧ-sŭs
Chelan, chē′-lăn′
Cheliabinsk, chĕl-yä-bĭnsk′
Chemnitz, kĕm′-nĭts
Cinchona, sĭn-kō′-nȧ
Demavend, dĕm-ä-vĕnd′
Dungeness, dŭnj-nĕs′
Esquimault, ĕs′-ke-mält
Fernshaw, fẽrn′-shạ
Flourine, flour′-ĭn
Fusiyama, fōō-zĭ-ä′-mä
Gamboge, găm-bōj′
Gloucester, glŏs′-ter
Guayaquil, gwī′-ä-kēl
Haidarabad, hī-dä-rä-bäd′
Haiti, hā′-tĭ
Halemaumau, hăl-ē-mä′-mä
Hawaii, hä-wī′-ē
Himalaya, hĭm-ä′-lä-yȧ
Hoang, hō-äng′
Honolulu, hō-nō-lōō′-lōō
Hugli, hōō′-glē
Iconium, ī-kō′-nĭ-ŭm
Irkutsk, ĭr-kōōtsk′
Jaipur, jī′-pōōr
Jinrikisha, jĭn-rĭk′-ĭ-shȧ
Juan de Fuca, hōō-än′-dā-fōō′-kä
Kamehameha, käm-ē-häm′-ē-hä
Kars, kärs
Kauri, kä′-u-rē
Karwau-Baschi, kär′-wȧ-bäs′-kĭ
Kenia, kē′-nĭ-a
Kharkoff, kär-kof′
Khartoum, kär-tōōm′
Kiakhta, kē-ak′-tä
Kieff, kī′-ĕf
Kiel, kēl
Kilauea, kē-low-ā′-ä
Kilimanjaro, kĭl-ē-män′-jä-rō′
Kioto, kē-ō′-tō
Kirghiz, kĭr-gēz′
Kiushiu, kē-ōō-shē-ōō
Kobe, kō′-bā
Kongo, kŏṉ′-gō
Koniah, kō′-nē-ä
Kootenai, kōōt′-ē-nā
Krasnoyarsk, kräs′-nō-yärsk′
Kurgan, kōōr′-gän
Kuroshiwo, koo′-rō-shē′-wō
Ladoga, lăd′-ō-gȧ
La Mancha, lä-män′-chä
Liau-Tong, lē′-ow-tŏng′
Liege, lī-āzh′
Lille, lēl
Linnæus, lĭn-ē′-ŭs
Madeira, mȧ-dē′-rȧ
Madras, mȧ-drăs′
Magdeburg, mäg′-dē-boorg′
Maguey, mȧ-gwā′
Maimatchin, mī-mä-chēn′
Mandelay, măn′-dē-lā
Manihot, măn′-ĭ-hŏt
Manila, mȧ-nĭl′-ȧ
Martinique, mär-tĭ-nēk′
Matterhorn, mä′-tẽr-hōrn
Mauna Loa, mow′-nä-lō′-ä
Maui, mow′-ē
Mauritius, mạ-rĭsh′-ĭ-ŭs
Mechlin, mĕk′-lĭn
Mecklenburg, mĕk′-lĕn-bûrg
Micronesia, mī-krō-nē′-shĭ-ȧ
Minots, mī′-nŏts
Mocha, mō′-ka
Moii, mō-ē
Molokai, mō-lō′-kī
Molucca, mō-lŭk′-kȧ
Mombasa, mŏm-bäs′-ä
Munich, mū′-nĭk
Nagoya, nä-goi′-ä
Nelson-Saskatchewan, nĕl′-son-săs-kăch′-ē-wạn
Nemain, nī-mān′
Netherlands, nĕth′-er-lăndz
Nevskii Prospekt, nĕv′skĭ prŏs′-pĕkt
Nikolskoe, nē-kōl′-skē
Nippon Yusen Kaisha, nĭ′-pŏn ŭ-zēn kā-ī-shä
Novgorod, nŏv′-gō-rŏd
Oaxaca, wä-hä′-ka
Oahu, ō-ä′-hōō
Orinoco, ō-rĭ-nō′-kō
Orizaba, ō-rē-thä′-bä
Pago-Pago, pä′-gō pä′-gō
Panama, păn-ä-mä′
Peiho, pā-hō′
Pribilof, prē-bē-lŏv′
Pulque, pụl′-kā
Riga, rē′-gä
Rubens, rōō′-bẽnz
Sahama, sä-hä′mä
Saigon, sä-ē-gŏn′
Samoan, sä-mō′-än
Savaii, sä-vī′-ē
Shimonoseki, shĭm′-ŏ-nō-sĕk-ē
Stuttgart, stōōt′-gärt
Tabriz, tä-brēz′
Tanganyika, tän-gän-yē′-kä
Tashkent, täsh-kĕnt′
Tchad, chäd
Tobol, tō-bŏl′

Tobolsk, tō-bŏlsk′
Triest, trē-ĕst′
Tripoli, trĭp′-o-lĭ
Tsitsika, tsēt′-skē
Tunka, tŭn-kä′
Uganda, ū-gän′-dä
Ujiji, o͞o-jē′-jē
Verkhoyarsk, vērk-hō-yärsk′
Vladimir, vlä-dē′-mēr
Vladivostok, vlä-dē-vōs-tōk′
Wallaby, wŏl′-lä-bў
Wenatchee, wē-năch′-ē
Woonsocket, wo͞on′-sŏk-ēt
Yakuts, yä′-ko͞ots
Yang tse Kiang, yăng′ tsē kē-äng′
Yawatu Maru, yä-wä′-to͞o-mä-roo′
Yenisei, yĕn-ē-sā′-ē
Yerba Mate, yĕr′-bä-mä-tā′
Yokohama, yō-kō-hä′-mä
Ypres, ē′-pr
Zambesi, zäm-bē′-ze
Zanzibar, zän′-zĭ-bär
Zermalt, zēr-mält′
Zurich, zo͞o′-rĭk
Zuyder Zee, zī′-dĕr zē

INDEX.

A.

C.

G.

H.

N.

O.

P.

Q.

R.

S.

T.

U.

V.

W.

Y.

Z.

INDEX TO ILLUSTRATIONS.

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